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EDITORIAL

Chemical Dinners

ersary dinner of the Chemical Society Y was a conspicuous success : there was a gathering at Dorchester House that included a great number otable chemists and there was a sufficient interval re the dinner to have a little talk with the many nds whom we are all glad to meet again. The ches were not too many and were excellent examples ppropriate after-dinner speeches, not so learned as e burdensome and not too light to be trivial. It a banquet held in state and extremely well organized. next evening an informal family dinner was held London club to entertain three distinguished men science who have recently received some notice heir great work from the Chemical Society. We r to Professor Debye, Principal Sir James Irvine, Professor Haworth. The family party included e than a dozen well-known scientific men and some rs who were glad to be better acquainted with fessor Debye and glad to pay informally and inadetely their tribute to the very important work on rs associated with the names of Irvine and Haworth. have seldom listened to more pleasant or more ninating after-dinner talks from chemists and physis than those that graced that true symposium. senior active chemist and our youthful friend man agreed in recognition of Debye's work on ociation and we gladly listened to an extremely resting account of the work of our two great experts the constitution of the sugars. This is indeed work ingular merit and one of the ornaments of modern tish chemistry. If we regret that Irvine has now nuch responsibility in connexion with his University k that he can no longer find so much time for research he did, we can on the other hand admire the great ninistrative ability he has displayed at St. Andrews, t has done much to enhance the reputation of that versity and f chemists in general. Haworth doubt will continue to receive well-deserved laurels his future research. We hope that Professor Debye take back to Germany a pleasant recollection of visit her ; we shall certainly look forward to his t visit to this country.

The Structure of Molecules

The chemist has long been accustomed to regard the molecule as a cluster of atoms held together by valency forces and arranged in a more or less definite order inside an outer shell. Within recent years however, there has been an increasing tendency to probe deeper by applying physical methods of measurement, and a much more complete picture of molecular structure is gradually emerging. Interatomic distances may now be determined with considerable accuracy. The relative strengths of chemical linkages and the angles between valency bonds may be measured, and in the case of some of the simpler molecules, the electronic orbits and rotational and vibrational motions of the molecule have been analysed. Of these new methods, the use of *X*-rays for the analysis of crystal structure is already well established. It is possible by this means to measure the distances between atoms regularly arranged, as in a crystal, or even partially oriented, the values being of the order of 1—10 Å (*i.e.*, Ångström unit = 10^{-8} cm.). Quite recently Debye has found that *X*-rays are scattered by gases and vapours, the scattered beam producing a pattern on a photographic plate, and he has been able to derive interatomic distances in this way, for molecules in the free (gaseous) state, with considerable accuracy. A further method depends on the scattering of a narrow beam of electrons by matter. The scattered beam again produces a regular pattern on the photographic plate, which may be interpreted to give interatomic distances in the scattering substance. The latter may be a solid, a liquid, or a gas, and the method has the advantage over the use of *X*-rays that only short exposures are needed. It appears to have special advantages for the examination of thin films on surfaces. The type of result obtainable is well illustrated by the compounds CCl_4, $CHCl_3$, and CH_2Cl_2, in which the distances between two chlorine atoms are found to be respectively 2·99, 3·11, and 3·23 Å. In CCl_4, the distance between the carbon atom and the chlorine atom is 1·83 ± 0·02 Å. Such figures may be obtained for many compounds either by the Debye method, or by electron diffraction. Spectroscopic methods of studying molecular structure all depend on the examination of band spectra.

Bands, either in absorption or in emission, are always *associated with molecules, whereas line spectra come* from atoms. A number of polar molecules (*e.g.*, HCl) absorb light in the far infra-red, with increase in their energy of rotation. A second possibility is that both the rotational and the vibrational energy may increase by the absorption of light, when bands in the near infra-red will be observed. By examining such bands, the moment of inertia and interatomic distance may *be calculated. The latter quantity, for example,* is found to have the values $0{\cdot}92 \times 10^{-8}$, $1{\cdot}28 \times 10^{-8}$, $1{\cdot}42 \times 10^{-8}$, and $1{\cdot}62 \times 10^{-8}$ cm. respectively, in the compounds HF, HCl, HBr, and HI. The study of Raman spectra offers a much simpler and more generally applicable way of determining vibrational and rotational *motions in the molecule. The Raman spectrum of a* transparent substance, which may be solid, liquid, or gaseous, is *observed on irradiating it with mono-*chromatic light, and photographing the spectrum of the radiation scattered at right angles. Besides the unchanged exciting frequency, this spectrum shows one or more new lines, displaced from the exciting frequency by amounts corresponding with the vibrational or rotational frequencies characteristic of the molecule. For some of the simpler molecules, Raman spectrum investigations afford a means of determining all of the internal vibrations, and the results have been correlated with those obtained from band spectra. In more complex substances, different groups, when present (*e.g.*, C—H, N—H, C=O, NO_2, NO_3, CN) contribute their own characteristic frequencies to the observed Raman spectrum, and these values have been used to calculate the relative strengths of the linkages concerned. Lastly, when an electron jump accompanies light absorption by the molecule, a complex band system in the visible or ultra-violet spectrum is produced, and may be analysed in simple cases and made to yield information about the electron orbits and the rotation and vibrations of the molecule. This has now been achieved for many simple systems (*e.g.*, N_2, H_2, O_2, NO). In the case of formaldehyde, to quote another example, the ultra-violet absorption spectrum has furnished us with the following molecular dimensions: C—O = 1·19 Å, H—H = 1·88 Å, C—H = 1·15 Å, and *the angle H—C—H = 110°.* The measurement of dipole moments of molecules has opened yet another approach to molecular structure. Polar molecules are those in which there are resultant equal and opposite charges on different parts of the molecule, the dipole moment being equal to the product of one of the charges and the distance between them. It is generally determined by measuring the dielectric constant. The *dipole moment of the whole molecule* may be considered as made up of the moments due to each of the valency links. Clearly in non-polar molecules it is possible that these partial moments, which are directed quantities, may just balance. This is believed to happen in CO_2, CS_2, and N_2O, which are non-polar, and in which the three atoms are probably arranged in a straight line. The molecules H_2O, H_2S, and SO_2, on the other hand, are polar, and probably have a triangular arrangement. With more complex molecules, it is possible to attribute definite dipole moments to linkages such as C—H, C—Cl, C—Br, and CH_3—Cl, and taking these moments as vectors, it may be possible to calculate the angles betw[illegible] the valencies necessary to give the observed dip[illegible] moment of the molecule as a whole. Work of this t[illegible] on dipole moments has met with conspicuous succ[illegible] in solving structural problems in organic chemis[illegible] Substitution in the benzene ring, questions of *cis-tr*[illegible] *isomerism*, and many similar subjects have been ta[illegible] up, a number being reviewed in the Annual Report[illegible] the Chemical Society for 1931 and 1932. It is of g[illegible] interest to find that these new methods of approac[illegible] stereochemistry furnish not only a complete verificat[illegible] but also a considerable amplification of the pio[illegible] work of van't Hoff and Le Bel, and of many ot[illegible] who have contributed to the subject in the past.

The Progress of Chemistry

The annual reports recently published by [illegible] Chemical Society cover a notable year, 1932, and a[illegible] interesting as ever and perhaps in some respects [illegible] readable than usual. General and physical chem[illegible] have been surveyed by Messrs. E. J. Bowen, [illegible] Hinshelwood, N. V. Sidgwick, and others, inor[illegible] chemistry by Dr. H. Bassett, organic by Drs. E. [illegible] Farmer, G. A. R. Kon, and H. King, analytical by [illegible] J. J. Fox and Mr. B. A. Ellis, biochemistry by Messr[illegible] A. G. Pollard and J. Pryde, geochemistry by Mr. A. [illegible] Hallimond, and radio-activity by Dr. A. S. Russe[illegible] Among the most noteworthy items of news are th[illegible] artificial disintegration of lithium, boron, carbon, fluo[illegible] ine, and aluminium nuclei by α-particles, and the di[illegible] covery of isotopes of hydrogen, carbon, nitrogen, an[illegible] oxygen. The existence of a neutron seems according t[illegible] *Chadwick to be the simplest interpretation* of a numb[illegible] of observations made by several investigators. Work o[illegible] the element No. 87 by Papish and Wainer and b[illegible] Barnes and Gibson is discussed; the new elemen[illegible] appears to have a mass of about 220. Molecular spectr[illegible] seem to throw a good deal of light on the position of th[illegible] various atoms in the molecule and their distances fro[illegible] each other. The methods of studying this proble[illegible] *include X-ray or electron diffraction* methods and th[illegible] investigation of the fine structure of absorption band[illegible] and Raman effect data. The triangular nature of th[illegible] molecules of H_2O, H_2S, and SO_2 is explained and th[illegible] lengths of the sides given, so too with the pyramid[illegible] molecules of NH_3 and CH_4. About a third of the volum[illegible] is devoted to organic chemistry and some of this, quit[illegible] naturally and properly, is intended for those who hav[illegible] more than a nodding acquaintance with the subjec[illegible] but there are accounts of progress in connexion with th[illegible] polysaccharides and the terpenes that will interes[illegible] many readers. Robinson's work on the chemistry o[illegible] the anthocyanins has for a long time shown grea[illegible] progress and during the last year he and Todd hav[illegible] succeeded in synthesizing the fine diglucosides known a[illegible] hirsutin, malvin, pelargonin, peonin, and cyani[illegible] chlorides. Much work has been done on the alkaloid[illegible] and new formulæ are suggested for brucine and strych[illegible] nine. There is an interesting account of recent work o[illegible] the pyrrole pigments. Vitamins are of course carefull[illegible] and adequately discussed and it seems to us that n[illegible] matter what branches of chemistry are selected a grea[illegible] deal of valuable work has been done.

THE PREVENTION OF PONDING ON SEWAGE FILTERS BY MEANS OF CHLORINE TREATMENT

By JOHN HAWORTH

Recently the prevention of ponding of sewage filters by means of the application of chlorine has excited interest.* The author has carried out several experiments at the works of the Sheffield Corporation Sewage Disposal Department to determine the efficacy of chlorine in sewage treatment and bearing on this point results of considerable interest have been obtained which are reported in the following paper.

It has been found that the development of ponding of filters owing to excessive organic growths can be prevented by continuous chlorination of the settled sewage or tank effluent feeding a filter with a small chlorine dosage (about 15 parts per million). Abnormal growths which give rise to ponding can also be suppressed in some cases by severe treatment with sodium hypochlorite solution (3·5% available chlorine strength) applied directly to the growth. The relief of ponding once firmly established, however, is a difficult matter necessitating drastic treatment with large doses of chlorine.

The most common type of sewage filter is a bed of graded clinker, slag or stone, usually about 4 to 6 ft. deep, the sewage being distributed over the surface by sprinklers provided with rotating arms or by travelling distributors.

Purification of the sewage is effected in the presence of air by a slimy or gelatinous bacterial film (containing bacterial and other forms of life) which develops and covers the pieces of material forming the filter. Under normal working conditions the sewage passes freely over the bacterial film and through the filter. Despite the constant growth and decay of the material of the film the total mass of bacterial film is small. In winter however, owing to low temperature and high sewage flows, the amount of film on the filter medium may become greater and in addition decayed growths, instead of flushing through the filter, accumulate chiefly in the upper layers of the medium as a black sludge. Under these conditions the flow of sewage through the filter is retarded, sometimes to such an extent that pools of sewage collect on the surface of the filter. This is the condition known as ponding. While mere dirtiness of a filter is undesirable, there is in general no serious effect on purification efficiency, but when a filter ponds, purification efficiency decreases markedly, the free passage of air to the organic life being prevented.

In addition to winter ponding, two other forms of ponding are of importance. First, ponding is very frequently associated with the working of very old filters, the medium of which has become dirty and clogged with accumulated sewage matter or humus or disintegrated material. In this case ponding is usually intermittent throughout the whole of the year, though generally worse in winter.

The relief of ponding is sought for by promoting the removal of such accumulated solids, for which purpose chlorine is reported to be satisfactory. Secondly, filters occasionally become infected with abnormal surface growths which flourish to such an extent that the medium is copiously covered and the interstices of the surface medium closed up, so that ponding readily occurs.

* See Bibliography.

Experimental

The following experimental work on the application of chlorine to sewage filters was performed at Sheffield on certain filters at the Hollinsend, Coisley, and Woodhouse Works from 1929 to 1932. All the filters were treating settled domestic sewage.

For chlorinating settled sewage or tank effluent a Paterson Chloronome was employed for metering (as gas) the requisite amount of chlorine to be applied, the gas after metering being dissolved in water and added to the sewage as chlorine solution (approximately 0·25% chlorine strength). For preparing strong chlorine water (0·5% to 1·0% chlorine strength) to be applied by hose direct on to the filter medium, chlorine delivered from a 70-lb. cylinder was fed into the air intake of an ordinary glass laboratory filter pump, the hose being attached to the normal water exit of the pump. Chlorine consumption, in this case, was determined by direct weighing of the cylinder on a small platform scale. Sodium hypochlorite solution and bleaching powder (both solid and solution) were also used in certain experiments.

Prevention of Ponding

(a) *Work at Hollinsend* (*winter* 1930—31 *and* 1931—32).—Three filters at this works were chlorinated continuously from June to December, 1930, at approximately 15 parts per million for other experimental work. Owing apparently to chlorination the advent of winter working conditions did not result in excessive growth of films. Chlorination was discontinued from December 5, 1930, to January 9, 1931, during which time the growths increased rapidly. On January 9, 1931, chlorination was resumed on Nos. 1 and 2 filters, keeping No. 3 unchlorinated as a control. No. 1 received approximately 7 parts per million and No. 2 approximately 15 parts per million. By February, No. 3 was commencing to pond slightly and its effluent was slightly inferior to Nos. 1 and 2 effluents, and No. 3 medium carried a heavy zoogleal growth, while the medium on Nos. 1 and 2 was clean. This condition persisted until the end of April when the winter working cycle of the filters terminated with the spring unloading of humus from the filters.

Chlorination was continued throughout summer, 1931, the dose being approximately 15 parts per million on Nos. 1 and 2 filters. By September, 1931, No. 3 was beginning to show the effect of continued bad weather with its low temperature and high sewage flows, No. 2 medium being clean and No. 3 medium appreciably dirty. Owing to the comparatively good weather of winter 1931—32, No. 3 never became excessively dirty or badly ponded, but while Nos. 1 and 2 kept clean, No. 3 by the end of the winter, was dirty and subject to occasional light ponding. These results for two successive winters indicate that continuous chlorination of the tank effluent feeding a filter with a small chlorine dosage enables the filter to work in a cleaner condition, excessive growths and any tendency to pond being prevented.

(*b*) *Work at Coisley Hill Lower Works (winter*, 1929—30 *and* 1930—31).—In both winters the ponding problems on the one 30-ft. diameter filter at this works was different from the ordinary winter ponding due to excessive growths. During both winters the surface medium became covered with a pink fungal growth, which flourished rapidly and formed a thick gelatinous skin sealing the interstices of the medium.

In the winter 1929—30 the growth increased rapidly during January. From February 11 to March 7 discontinuous chlorination was carried out on 8 days by hosing strong chlorine water (approximately 0·5—1·0% chlorine) over half the filter surface, the chlorine used ranging from ½ to 6½ lb. per treatment. The total chlorine used was 31 lb. The growth was not removed and later some ponding occurred, but the growth gradually disappeared under natural conditions. In the winter 1930—31 the growth appeared first in the middle of December and before the end of December had flourished so rapidly that the surface medium was copiously covered. On December 31 half the filter surface was treated with 7 lb. of chlorine applied as dilute sodium hypochlorite solution (3·5% available chlorine strength) by watering cans. The growth was removed in 1 to 2 days, while on the untreated half the growth persisted in such amount that by the end of January the untreated half was badly ponded. A second treatment on the treated half was carried out on February 6, when 4 lb. of chlorine were applied from watering cans as dilute bleaching powder solution. This treatment was a precautionary measure against possible new development of the growth. The bad ponding on the untreated half persisted until the end of February, when the growth began to decay owing to natural causes.

These results indicate that abnormal or other fungal growths occurring on a filter during winter can be quickly and efficiently removed by treatment with a strong solution of chlorine (approximately 3% chlorine strength) in the form of sodium hypochlorite, and in this way ponding due to unchecked growth development is avoidable. It is evident that mild discontinuous treatment as in 1929—30 is of no value. Since only half the filter was treated, no accurate measure could be made of the possible adverse effect of the 1930—31 treatments on filter efficiency. The purification efficiency must be affected but perhaps not seriously.

Relief of Ponding

(*a*) *Work at Hollinsend*. (*January—May*, 1930).—Three 45-ft. diameter filters at Hollinsend were ponded in January and February, 1930. Three experiments were performed.

(i) Treatment of No. 1 filter from January 22 to February 12, with discontinuous small doses of chlorine on 11 days during this period, the average time of chlorination being 6 hours and the average dose 20 parts per million, the total chlorine used being 35 lb. Chlorine was applied as chlorine water to the tank effluent feeding the filters.

(ii) Treatment of No. 3 filter from February 4 to February 27 with discontinuous large doses of strong chlorine water (approximately 0·5—1·0% chlorine strength) distributed direct over half of the filter surface the sewage flow being shut off during chlorination. Treatment was given on 10 days during the period with times of chlorination of 2 to 4 hours and the chlorine applied per treatment ranging from 2 lb. to 24 lb. The total chlorine consumption was 86 lb.

(iii) Treatment of Nos. 1 and 2 filters from March 3—10 with a continuous moderate dose of chlorine (approximately 35 parts per million) applied as chlorine water to the tank effluent feeding the filters. The total chlorine used was 125 lb.

In experiment 1 ponding was not relieved although the surface medium was cleansed and to some extent the sub-surface growths decreased. In experiment 2 the treated half of the filter was improved, ponding became less, the surface medium being cleaned and the amount of sub-surface growths decreased. In experiment 3 the treatment did not relieve ponding or give any useful cleansing of the sub-surface.

These results indicate that the relief of well-established ponding is a difficult matter since the brief application of moderate chlorine dosages is of no value, while the promising results of the treatment of No. 3 with strong chlorine water are counterbalanced by the fact that such drastic treatment must decrease filter efficiency.

(*b*) *Work at Woodhouse Mill* (*April*, 1930—*September*, 1932.)—By 1930 No. 1 filter at Woodhouse Mill (31 ft. diam.) had been in operation for at least 30 years with the result that the filter medium, which originally had been of rather small grade, had disintegrated extensively and become clogged with accumulations of oxidized sewage matter or humus. This condition gave rise to frequent and extensive ponding, so that the filter was rested whenever possible and the surface medium thoroughly forked over at least once a month.

On April 9, 1930, 10 cwt. of bleaching powder were dug into the surface and sub-surface medium of the filter. No immediate improvement was obtained, but in June the ponding was less and the surface medium very clean. By the end of August ponding was entirely relieved and the filter worked satisfactorily until February, 1931, when an occasional slight ponding commenced. By the end of May the filter was badly ponded again. On May 29, 1931, 9 cwt. of bleaching powder were dug into the medium, as in 1930. This repeat treatment gave immediate and almost complete relief of ponding. By August, 1931. there was no ponding and the filter worked without ponding from then until September, 1932.

It is evident that an excessive dose of bleaching powder forked into the filter medium can relieve the ponding due to the old and clogged condition of a filter. Although purification efficiency will be impaired for a short time this is not serious, since old filters in any case cannot treat a full load of sewage with the efficiency of more modern installations.

(*c*) *Work at Coisley Hill Upper Works* (*February*, 1931—*July*, 1931).—During the course of another investigation an experiment bearing on ponding control was performed on No. 3 (45 ft. diam.) filter at these works. The tank effluent was treated with bleaching powder solution for five nights a week. The bleach

sed for each night's treatment was 12 lb. It was und that the medium on No. 3 became cleaner than he medium on the unchlorinated control filters (Nos. 1 nd 2) and also some slight ponding on the filters was eleved on No. 3. Unfortunately the treatment duced purification efficiency. However, it is indicated at such treatment can control the cleanliness of a lter and also relieve slight ponding.

Conclusions

The results obtained are probably not as complete s might be desired owing to the small number of lters used for experiment, and the variations in mode of onstruction, age, condition, and general behaviour of ne few filters which were employed. This however, oes not imply that the data cannot be usefully applied other filters and ponding problems. The results ipport the following conclusions :

(i) The relief of well-established ponding is a difficult atter necessitating drastic treatment with large oses of chlorine (0·5 to 1% Cl_2) preferably applied as rong chlorine water, bleach solution, or hypochlorite irect to the surface medium, say, by hose or watering ans. Such treatment will generally reduce filter urification efficiency but this is not serious since a lter quickly recovers from an overdose of chlorine and, any case, efficiency will already be low owing to nding. With winter ponding it is evident that drastic eatment appears capable of giving rapid relief, and lless relief is rapid it is of little value, since the low iciency owing to ponding is most undesirable and the nding will take a long time to clear naturally. In neral, winter ponding does not disperse naturally til the spring.

(ii) In those cases where well-established ponding is ving to the age and clogged condition of the filter ceptionally drastic treatment is required and the sults obtained by forking solid bleaching powder to the medium are promising. The temporary incapacitation of such a filter is of little importance since old filter cannot treat a full load of sewage efficiently d thus anything that can be done to increase its pacity and efficiency is justified. Whether it is lvantageous to apply chlorine in the form of hypochlorite or as free chlorine is a matter for further vestigation.

(iii) *It seems clear that winter ponding can be pre*nted by continuous chlorination of the tank effluent eding a filter with a small dose of chlorine. Such treatent does not reduce filter efficiency and the filter is abled to work throughout the winter in a clean ndition. While the dose in the Hollinsend experients on this problem was approximately 15 parts r million, it is probable that a smaller dose (not ceeding 10 parts per million) would have given the me results. This follows from the fact that with parts per million the mass of film growths was reduced ore than necessary, so that a smaller dose would have ven sufficient control to prevent ponding.

(iv) *Where ponding is imminent* as the result of the tensive development of an abnormal fungal or other owth it is proved that even when well established such growths can be removed by moderately severe treatment with a strong solution of a chlorine agent (3·5% Cl_2) applied direct on to the filter media.

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THE RING-SYSTEM OF STEROLS AND BILE ACIDS—PART III.*

Observations on the Structure of the Diels' Hydrocarbon $C_{18}H_{16}$

By O. ROSENHEIM and H. KING

The nature of ring IV in the sterol and bile acid formula, which we proposed a year ago, still remains undecided. The available experimental evidence, which has recently been critically reviewed by Ruzicka and Thomann,[1] is inconclusive and allows the formulation of ring IV as either a cyclopentane or cyclohexane ring.

A knowledge of the constitution of the hydrocarbon $C_{18}H_{16}$, obtained by Se-dehydrogenation from cholesterol,[2] ergosterol,[3] and cholic acid[1] is of decisive importance in this respect. Owing to the difficulties connected with its isolation and purification however, this hydrocarbon is obtainable in such small amounts only that an elucidation of its structure by direct chemical methods has hitherto not been feasible. We had therefore recourse to physical methods, and by a comparative study of the ultra-violet absorption spectra of various chrysene- and phenanthrene-derivatives arrived at the conclusion that the hydrocarbon $C_{18}H_{16}$ is a substituted phenanthrene (this Journal, 1933, p. 10). The striking similarity between the absorption spectra of $C_{18}H_{16}$ and 1-methyl-7-*iso*propylphenanthrene (retene) is evident in the curves shown in Fig. 1.† The two hydrocarbons agree not only in the wavelength of each of their eight sharp bands, but the four most intense bands agree in intensity as well. Phenanthrene itself has a similar spectrum, differing slightly in wavelengths as well as in intensities.

In this connexion we have been able, through the kindness of Dr. W. A. Jacobs, to examine the ultra-violet absorption spectrum of the hydrocarbon $C_{16}H_{14}$ obtained by Se-dehydrogenation of strophanthidin.[4] This hydrocarbon was considered to be a dimethylphenanthrene, since its oxidation with CrO_3 yielded a quinone, which gave a phenazine derivative. A comparison of its absorption spectrum with that of 1 : 2 : 7-trimethylphenanthrene and $C_{18}H_{16}$ shows again close agreement in the wavelengths and intensities of the four most intense bands, differing only in the intensities

* For Parts I and II see this Journal, 1932, pp. 464, 954.

† We are indebted to Dr. Cook for a specimen of $C_{18}H_{16}$ from cholesterol, which gave an absorption spectrum identical with that of Diels' own preparation, kindly put at our disposal by Prof. Windaus.

of the subsidiary bands (Fig. 2). Measurements made by our colleague Mr. F. A. Askew of 10 other di- and tri-substituted alkylphenanthrenes, synthesized and

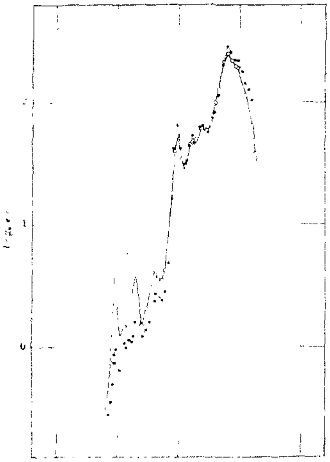


FIG. 1

Absorption spectra of 1-methyl-7-isopropylphenanthrene (retene) ···●·········●··· and hydrocarbon $C_{18}H_{16}$ from cholesterol --○- ——○——

kindly supplied to us by Dr. R. D. Haworth, indicate that the variations in the intensity of the subsidiary bands are due to the different size and position of the substituents in the phenanthrene ring-system. The spectroscopic evidence confirms the conclusion of Jacobs and *Fleck*[4] *that the hydrocarbon $C_{16}H_{14}$ from stroph*-anthidin is a substituted phenanthrene and the close resemblance of its absorption spectrum to that of $C_{18}H_{16}$ (cf. Figs. 1 and 2) demonstrates the near relationship of the cardiac glucosides of the strophanthidin- and digitalin-group to the sterols and bile acids. The *X*-ray crystallographic measurements of these hydrocarbons, carried out at our suggestion by Mr. Bernal (this JOURNAL, 1933, p 10), are in full agreement with these conclusions.

The chemical behaviour and composition of $C_{18}H_{16}$ however, are against the assumption that the hydrocarbon derived from sterols and bile acids has the constitution of an alkylphenanthrene, isomeric with that obtained from strophanthidin, for, in contrast to the latter, it fails to furnish a quinone on oxidation with chromic acid.[2, 4] The possibility that the phenanthrene nucleus of $C_{18}H_{16}$ might be substituted at C_9 or C_{10} and that such substitution might prevent quinone formation is disproved by the fact, kindly communicated to us by Dr. Cook, that the methyl group in 9-methylphenanthrene hinders, but does not prevent, its oxidation to phenanthraquinone by chromic acid. The hydrocarbon $C_{18}H_{16}$ does not contain the chrysene nucleus as it resists dehydrogenation,[1] whilst synthetic 1 : 2 : 3 : 4-tetrahydrochrysene is easily dehydrogenated to chrysene (private communication by Dr. R. D. Haworth). We have previously pointed out (this JOURNAL, 1932, p. 954) that the spectroscopic evidence does not exclude the possibility of a five-membered ring IV. attached to phenanthrene. At the suggestion of Dr. Cook, who kindly supplied the hydrocarbons, we tested experimentally the analogous case of 6 : 7-cyclopenteno-1 : 2-benzanthracene and 6 : 7-dimethyl-1 : 2-benzanthracene. The absence of displacement in the absorption bands of the curves shown in Fig. 3, demonstrates the limitations of spectroscopic analysis by its failure to distinguish between the attachment of a saturated five-membered ring or two methyl groups to 1 : 2-benzanthracene.

Since the spectroscopic evidence affords, however, conclusive proof that the hydrocarbon $C_{18}H_{16}$ is a phenanthrene derivative, we consider, taking in account

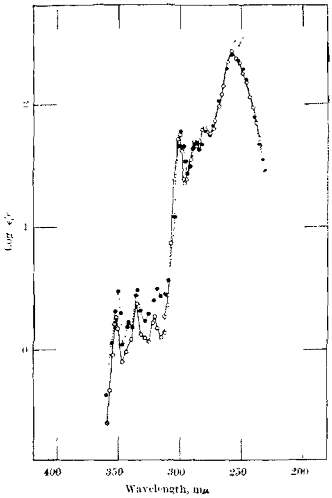


FIG. 2

Absorption spectra of 1 : 2 : 7-trimethylphenanthrene ——○——○——
and hydrocarbon $C_{16}H_{14}$ from strophanthidin ···●·········●···

the other evidence, that its constitution may be represented as that of a methyl-1 : 2-cyclo-pentenophenanthrene, *i.e.*, a substituted hydrindene with a secondary methyl group in the cyclopenteno-ring. In accord

with this formulation are its stability to permanganate (in boiling acetone) and the formation of a characteristic nitro-derivative[2] of unknown structure which may have

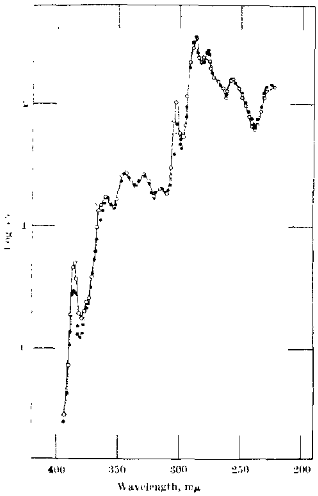


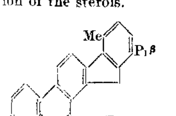
FIG. 3

Absorption spectra of 6 : 7-*cyclopentemo*-1 : 2-*benzanthracene* ••••●••••●••••

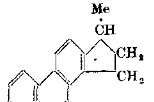
and 6 : 7-*dimethyl*-1 : 2-*benzanthracene* —o——o—

an analogous constitution to the tertiary nitro-derivative of methyl cyclopentane.[5, 6]

The existence of a preformed methylcyclopentane ring in the cholane structure is improbable, since a fluorene ring-system with an unsubstituted methylene group is essential to account for the properties of the pentacyclic hydrocarbon $C_{25}H_{22}(C_{25}H_{24}?)$ (I), produced simultaneously with $C_{18}H_{16}$ during selenium dehydrogenation of the sterols.



(I)



(II)

The necessary corollary for the formation of a methyl cyclopenteno-ring in $C_{18}H_{16}$ from a nuclear structure containing two tertiary methyl groups at C_{10} and C_{13}, is therefore the migration of a tertiary CH_3 group into a position in ring IV. Such a process must involve an unusual mechanism, since tertiary methyl groups are ordinarily lost during Se-dehydrogenation. We suggest that when the side-chain at C_{17} is removed from cholesterol (ergosterol or cholic acid) by selenium, the methyl group at C_{13} takes up the adjacent vacant position on C_{17}, thus preserving the saturation of the five-membered ring IV. The hydrocarbon $C_{18}H_{16}$ on this view has the constitution 3-methyl-6 : 7 : α : β-naphthohydrindene (II). It is to be expected that by the synthesis of this relatively simple compound the one undecided feature of the new cholane formula will soon be settled.

The absorption measurements were made by the method described by Philpot and Schuster (Special Report Series, Medical Research Council, 1933, No. 177). We are greatly indebted to our colleagues F. A. Askew, W. Herkel, and J. St. L. Philpot for the numerous measurements connected with this work.

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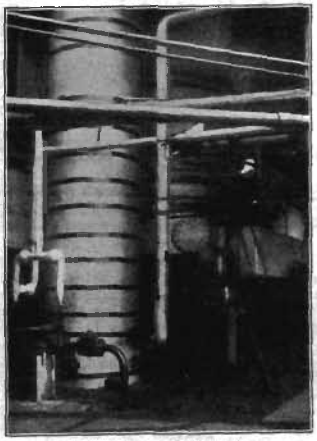
SOUTH METROPOLITAN GAS CO., LTD. TAR WORKS

On the face of it tar seems rather a prosaic subject. Most of the encyclopædias seem to think so, for after finding a morbid interest in tapeworms and dwelling nauseatingly on tapioca, they jump quickly off this nasty subject of tar and on to the more stimulating caprices of Tartarin in Tarascon. But tar is not such a dull subject as it appears at first sight, and especially is this so with the chemist. It is indeed full of colour, if such blatant facetiousness may be forgiven—every shade of colour from the brilliant mauve of Perkin to the more recent jade of Sundour, and it would be hard to find a phase of chemical history providing as much interest as that which began in 1819 with William Garden's discovery of naphthalene in the products of coal distillation.

Our first sight of tar at the Greenwich tar works of the South Metropolitan Gas Co. was provided by a stagnant pool that lay peculiarly unruffled on a rather windy day: this, we were told, was a storage well, and held something like a million and a third gallons of crude tar, brought by pipe lines from the gas works of the company, the huge containers of which could be seen in the distance. From this well the tar is taken to settling tanks, one of which is always connected to supply the continuous stills in which the tar is separated into various fractions. Some of the water contained in the crude tar is removed in the settling process, but the bulk is removed by an intermediate scrubber utilizing superheated steam before the tar enters the still.

Distillation is carried out in two "continuous" stills, the larger of which has a capacity of 26,000 gallons a day: some idea of what is meant by "continuous" is conveyed by the information that this still has operated without a stop for thirteen months, and in that time 10,000,000 gallons of tar have passed through it. It would be out of place here to attempt a detailed

description of these stills; the laymen indeed would be wearied with a tale of pipe lines, lagged and otherwise, and of temperatures and pressures under strict control, while the expert would find our details merely inadequate. Briefly, the tar is pumped through a pipe line in which it is subjected to heating, and subsequently to a series of successive condensations, and so separated into three fractions, which can be called the heavy oil or anthracene fraction, the middle oil or creosote fraction, and the light oil fraction containing benzene, toluene, pyridene, and other more readily volatile hydrocarbons. Each fraction is collected separately for further treatment, and the residual pitch is passed through a cooler and out to the "bays," where it sets to a solid mass. This pitch we saw being broken up, rapidly loaded into tip-trucks, picked up by a grab



Section of a continuous still

on a travelling crane, and in a short time deposited in a barge for despatch. At other times the pitch after partial cooling may be run straight into barrels.

The stills are heated by oil, fired in jets under steam pressure. Throughout the process of distillation the tar is subject to three controls, temperature, pressure, and rate of flow, and by manipulation of these controls the character of the fractions may be modified. By such adjustment, for instance, the residual pitch may be substituted by a product that is specially suitable for road tar. Probably the most interesting feature of the stills is however the economy which is effected in the supply of heat. Cold crude tar is first used as the cooling medium for the condensers in the stills, by which the double purpose is served of condensing the three fractions and of giving the tar a preliminary "warm-up," so that the subsequent distillation is facilitated. By this system of heat interchanging considerable fuel economy is made possible.

From this point the tar works is concerned with the treatment of the three fractions from the stills. The heavy oil is taken to a cooler, in which crystals of anthracene separate out: these are filtered off and centrifuged, and a granular mass is obtained which is free from paraffin and contains about 40% pure anthracene. The middle oil fraction undergoes a similar treatment by which the naphthalene is crystallized out, and may be further purified by various means. The treatment of the light oil is more complicated, as this fraction contains the naphthas which are volatile at low temperatures. The crude oil is first distilled through a tall fractionating column which divides it into fractions suitable for subsequent distillation, the principal products of fractionating at this stage being crude benzole, crude solvent naphtha, heavy naphtha, and creosote oil. These fractions are then subjected to further distillation by which a number of products are obtained, an important one being motor spirit, in the production of which a very thorough process of washing with sulphuric acid and caustic soda and a final distillation are required to ensure complete freedom from water and removal of deleterious impurities.

We have been able to give only the briefest outline of the work on the production side of the factory. To do justice to the works we should have to deal with the neatness of the plant, about which there is so little to suggest the processing of materials such as tar and creosote: with the efficient layout of the buildings, and the up-to-date plant inside and outside them. A feature which we noticed was the automatic nature of much of the plant—it requires only one man, for instance, to operate one of the huge stills. Mention must be made of another side of the works, that which deals with the despatch of road tar. Recently the company has introduced spraying machines for dealing with this material, but road tar is still largely packed in barrels, and the company finds it advantageous to have its own cooperage department. Here old barrels are cleaned up and repaired; anyone who loves to see a real craftsman at work should watch a cooper pursuing his trade, for it is fascinating to do so. During the winter this department is hard at work, and when the road-mending season arrives in spring a "mountain" of some 30,000 barrels is ready to be disseminated in rail trucks, road lorries, and by barges down the Thames which flows alongside, to the roads around London, to the provinces, and abroad.

We might conclude with a description of the first-aid dressing station, the dining-room, baths, and other facilities provided by the company for its workers, but the spirit of co-operation which exists in the South Metropolitan Gas Company is already well known. The company was one of the pioneers of the copartnership movement at its inception more than forty years ago, and every man employed by the company is now a shareholder, with his interest in the company's success and his representatives on the board of directors. The results achieved by such co-operation in industry do not need to be told here, for they have been ably demonstrated by many years of economical working and loyalty of service.

SOCIETY OF CHEMICAL INDUSTRY

NOTTINGHAM SECTION

At the annual meeting on Thursday, March 16, Mr. L. Anderson was elected chairman for next session, and a hearty vote of thanks was passed to Dr. Firth, the retiring holder of the office. The Council of University College was also thanked for the privilege of using the College buildings for the sectional meetings. Other officers elected were: *Vice-Chairmen:* Dr. J. B. Firth and Mr. H. Calam; *Hon. Treasurer:* Mr. D. J. Law; *Hon. Secretary:* Mr. W. T. T. Ainsworth; *Committee:* Dr. H. H. Barber, Messrs. G. Dixon, T. H. Gray, G. F. Hardcastle, T. F. Heyes, T. H. Jones, A. D. Powell, Dr. E. B. R. Prideaux, Dr. F. L. Pyman, Messrs. G. H. Rome, W. A. S. Whalvin, and W. Woodhouse.

A lecture was given by Dr. H. Baines on "The Riddle of the Roll Film." The lecturer gave a brief account of the history of photography, and outlined the processes in the manufacture of a film, showing slides of the different types of machines etc. The influence of the mode of emulsion making on the quality of the product was still only partially understood, but during the twentieth century the scientist had gradually taken the place of the old-fashioned emulsion maker, and in a few years' time the scientific principles of the process should be thoroughly elucidated.

The difficulties of manufacture were greatly increased by the necessary conditions of illumination, whilst increasing sensitivity was accompanied by increasing liability to marks, stains, etc. due to moisture, heat, and impurities. The products now available to the public were of a very high standard of excellence, and more free than ever before from mechanical defects.

The types of film introduced in recent years were superior in a number of ways; they were decidedly faster to daylight and were highly orthochromatic, giving a much more truthful rendering in monochrome of the tone values of the various colours of a view. They were double coated, the speeds of the two emulsions being carefully adjusted so that an exposure range was obtained nearly double that of a single-coated film; the slower undercoat also gave a finer grain in the highlights. Finally, the film had an anti-halation backing with a strong absorption in the blue-green.

In spite of these great advances many riddles concerning films still remained unsolved. It was, for instance, as yet impossible to state, without a practical test, the effect on photographic quality of any particular modification in the ingredients or treatment of an emulsion formula. It was practically impossible, also, to define accurately any photographic property such as speed, by a single number, and attempts to do this had resulted in considerable confusion. Batches of any one grade might vary by 20% in speed from the mean, to which variation must be added those due to changes in storage. The effective speed of a film might also vary with the developer used, and in commercial practice considerably greater discrepancies were found, so that a speed number could not be regarded as anything more than a rough guide.

A further problem was that concerning the exact mechanism of the action of light on the photographic film; very little was known about this with certainty, despite continuous research work.

OTTAWA SECTION

A meeting of the Ottawa Section was held in the Physics Lecture Room of the National Research Laboratories, Ottawa, on Thursday, March 16, when an interesting address entitled "The Structure of Textile Fibres" was given by Dr. Paul Larose of the National Research Council staff. Mr. Ross E. Gilmore, chairman of the Section, presided.

Introduced by Dr. G. S. Whitby in a few well-chosen remarks, Dr. Larose began by intimating that the term "structure" used in the title of the address was intended to be comprehensive and to embrace both chemical and physical aspects of the subject. Fibres were classified as of animal or of vegetable origin, artificial and modified. Cotton, wool, and silk were the best known representatives and would be used as types.

Slides of typical fibres were then thrown upon the screen. Cotton was the seed fibre of various species of *Gossypium*. Each fibre was from ⅞ in. to 1½ in. long and about 1/1300 in. in thickness and presented a twisted appearance. Cotton consists of about 90% of cellulose. Upon mercerization the fibres swell and become non-spiral and more or less cylindrical. Rayon fibres are solid. Flax and hemp fibres are both about 5 ft. long, the former somewhat finer than cotton, but the latter is rather coarse, varying from 1/80 to 1/500 in. in thickness. Jute is twice as long as flax and finer than hemp. It is more woody in structure and consists largely of a compound of cellulose and bastose. Mention was also made of Ramie.

Silk, procured from the silkworm, *Bombyx mori*, is a protein secretion. It appears under the microscope as a glassy rod. The secretion comes from two glands in the body of the worm which unite at the head thus forming two threads which issue from the head as a double thread. The length of thread varies from 400 to 1500 yards and the diameter from 1/500 to 1/1600 in. in diameter. Wool fibres vary from 2 in. to 18 in. in length. They consist of three parts, viz., outer scales, cortex, and medulla. In dealing with chemical composition, the lecturer remarked that an empirical formula such as that for cellulose, $(C_6H_{10}O_5)_x$ did not convey much information about chemical structure and properties of the substance. Possibly the cellulose molecule is really a very long strand of some 40 or 50 chains each comprising 100 to 200 glucose units and believed to be 50 Å in thickness and about 600 Å in length.

Wool consists chiefly of keratin, the formula for which is $(C_{41}H_{70-72}O_{14}N_{12}S)$. Analysis was difficult because of decomposition of amino-acids during hydrolysis and also to imperfect methods of separation of such compounds. Keratin occurs in three modifications, alpha, beta, and X, each of which varies slightly in ash, sulphur, and nitrogen content.

Silk is also a protein consisting mainly of fibroin with tyrosin as principal constituent and the balance sericin composed chiefly of the amino compound, serine. But the fibroin is not uniform for sodium hypobromite

affects different portions of the strand in different ways. It has been assumed to be a mixture of proteins existing individually in the fibroin.

Dr. Larose then proceeded to discuss his subject from the point of view of *X*-ray analysis showing on the screen a large number of pictures illustrating various features which had been employed in recent research to draw a relationship between chemical structure and physical appearance, curvature of hairs, extensibility, and other features.

JOINT MEETING OF YORKSHIRE SECTION AND PLASTICS GROUP

The annual general meeting of the Yorkshire Section was held on Monday, March 27, at the University of Leeds, when the officers and committee for the session 1933—34 were elected as follows: *Chairman:* Prof. N. M. Comber; *Vice-chairman:* Mr. W. Bain; *Hon. Secretary and Treasurer:* Mr. H. J. Hodsman; *Hon. Recorder:* Dr. A. L. Roberts; *Hon. Auditor* (Special Purposes Fund): Mr. G. F. Pickering; *Representative in the Chemical Engineering Group:* Mr. B. G. McLellan; *Committee:* Messrs. H. W. Bywaters, F. Challenger, H. B. Marston, G. E. Cowlishaw, A. E. Everest, H. G. Shatwell, W. J. Rees, H. M. Mason, W. D. Jarvis, and G. J. Denbigh. The last four are the new members.

On the motion of Prof. Comber a hearty vote of thanks for his services was extended to Mr. J. A. Craven, the retiring chairman, and carried with acclamation.

Following the annual general meeting, a meeting was held in co-operation with the Plastics Group, under the chairmanship of Mr. H. V. Potter, when Dr. D. F. Twiss, chief chemist, Dunlop Rubber Co., Ltd., delivered a lecture on "The Industrial Uses of Rubber Latex." The article will be published in CHEMISTRY AND INDUSTRY shortly.

CHEMICAL SOCIETY

ANNUAL GENERAL MEETING

The 92nd annual general meeting was held on March 30, the president, Prof. G. G. Henderson, F.R.S., occupying the chair.

The president presented the report of the council, and the treasurer, Mr. Emile Mond, presented the financial report and balance sheet, dealing in some detail with the various items and making an appeal for a largely increased membership roll. The adoption of the report and balance sheet was moved by Prof. E. C. C. Baly, seconded by Prof. J. E. Coates, and carried unanimously.

A vote of thanks to the auditors was proposed by the president and seconded by the treasurer.

Prof. J. L. Simonsen proposed a vote of thanks to the treasurer, secretaries, foreign secretary, council, and committees for their services during the year. Dr. W. M. Cummings seconded the proposal, and the motion was carried with acclamation. Prof. C. S. Gibson replied.

The election of Mr. H. Paget, Dr. H. J. S. Sand, and Dr. W. M. Colles as auditors for 1933—4 was proposed by Prof. R. Robinson, seconded by Prof. G. M. Bennett, and carried unanimously.

Mr. R. Craven proposed, and Prof. F. Challenger seconded, a vote of thanks to the scrutators.

The president then presented the Longstaff medal to Prof. W. N. Haworth and to Sir James Irvine, saying that the award, the highest honour the council can bestow on a Fellow of the Society, was for outstanding contributions to chemical knowledge. In his acknowledgment Prof. Haworth said that he shared the honour with his colleagues and pupils, past and present, who had been associated with his researches. Sir James Irvine referred to the origin and the extension of the researches in sugar chemistry, and remarked that research training in chemistry is one of the finest forms of preparation for any sphere of human activity.

The president next presented the Harrison Memorial Prize to Dr. H. J. Emeléus for meritorious and promising investigations, saying that it was intended to be an incentive to even more noteworthy researches. Dr. Emeléus briefly expressed his appreciation of the honour and his recognition of the responsibility thus placed on his shoulders.

Jointly with Dr. R. H. Pickard, president of the Society of Chemical Industry, Prof. Henderson then presented to Prof. J. C. Philip a volume containing a resolution, adopted by both councils, in which Prof. Philip's services as chairman of the Bureau of Chemical Abstracts from its formation in 1923 until the end of 1932 were acknowledged with gratitude. Prof. Philip, who in expressing his appreciation paid tribute to the loyal co-operation of his colleagues, remarked that it was of interest that there was an item on their agenda in which the two societies were co-operating. The Bureau was an experiment in co-operation, an experiment which had attained a large measure of success, and one which provided a means of expressing British views in international affairs relating to chemical abstracts.

PRESIDENTIAL ADDRESS

Prof. G. G. Henderson then delivered his presidential address entitled "The present position and the future of the Chemical Society." He dealt first with the Society's own affairs, reviewing the steps which are being taken to bring them into closer relation with the needs of the time, for "scientific societies in general, and the Chemical Society in particular, must be ready to modify their policy in accordance with the times. . . ." For example, the annual subscription for Fellows under 25 years of age who are prepared to forgo the right to receive certain publications has been halved, and local representatives have been appointed to arrange special lectures or discussions in collaboration with the local secretaries of other chemical organizations and to promote social intercourse among the Fellows. At the ordinary scientific meetings the custom of reading highly specialized papers will be further restricted and a larger number of meetings will be devoted to organized discussions and summaries of recent work. Some of the endowed and special lectures will be delivered outside London, and meetings devoted to lectures or discussions of a general character will also be held in other centres. In view of the existence of local sections of the Society of Chemical Industry and the Institute of Chemistry,

the establishment of local sections of the Chemical Society is not contemplated. Prof. Henderson also advocated a regional method of election of the Council.

Turning next to the association of the Chemical Society with other chemical organizations, Prof. Henderson said it was evident from articles and letters which have appeared in the chemical press during the past year that the project of union or federation of at least all the principal organizations concerned with chemistry is making an appeal to an increasing number of members of the profession. He continued: "The principal duty laid upon the Chemical Society is, first, to publish the results of original investigations communicated to the Society, of which the scientific value has been approved by the Publication Committee; and secondly to prepare and publish abstracts of current researches which appear in the chemical journals of other nations. Any enforced diminution of this activity would be too deplorable for words, and yet must follow unless the Society can find new sources of income or new methods of retrenchment. So long as the Society remains, as now, an independent organization, I cannot see how a larger income is to be obtained, and, as you are aware, every method of reducing expenditure which can be adopted under existing conditions has been closely investigated. The same statement applies generally to the Society of Chemical Industry, the Biochemical Society, the Faraday Society, and other societies more directly interested in various branches of applied chemistry which publish journals or abstracts or both. Consequently one is forced to the conclusion that some form of federation of these societies is not only desirable, but sooner or later inevitable. Moreover in my opinion such a federation would be incomplete and lacking in influence unless the professional organizations were also included as members." The kind of federation which he envisaged would not, to any material extent, involve the loss of individuality on the part of members, for each has its special sphere of activity on behalf of the subject as a whole and of the profession generally. The next two years must see great changes in the organization of the chemical societies in this country, and they of the Chemical Society must be prepared to give sympathetic consideration to the scheme put forward by the Federal Council for Chemistry, which had appointed a committee to go into this and cognate matters. He hoped and believed that the scheme would lead to the formation of a great federation. "When that goal is reached, we may feel confident that our work for the benefit of chemists, and hence of the community, will increase and that our profession will at last take its rightful place as one of the leading professions."

A vote of thanks to the president for his services and for his address was proposed by Sir Robert Robertson and was carried with acclamation.

Finally the president announced the result of the election of officers and members of council as follows: President, Prof. G. T. Morgan. Vice-presidents who have filled the office of president, Prof. G. G. Henderson and Prof. W. P. Wynne. Vice-presidents who have not filled the office of president, Prof. F. G. Donnan and Prof. C. S. Gibson. Honorary secretaries, Prof. S. Sugden and Dr. J. M. Gulland. Members of Council (Town), Dr. J. Kenyon, Dr. G. A. R. Kon, Mr. J. Davidson Pratt, (Country), Dr. R. G. W. Norrish, Dr. E. H. Rodd, Prof. R. Whytlaw-Gray.

Anniversary Dinner

The anniversary dinner was held at Grosvenor House in the evening; Prof. G. T. Morgan, F.R.S., the president, was in the chair. After the loyal toasts Lord Melchett proposed "The Chemical Society" coupled with the name of the president; he referred to the recent aeroplane disaster and the explosion at Mitcham and stated:

"People say that science has invented too much, but one has only to look at two such catastrophes to realize how much remains to be invented. There is ample opportunity for chemistry to produce some kind of non-inflammable fuel for the aeroplane, or, through the allied science of metallurgy, to invent some light metal not so liable to fire. The same is true of the terrible explosion at Mitcham, where one hopes that in due course science will invent a new method of overcoming the danger of accidents to which we are sometimes subject to-day."

Lord Melchett said that through the inventions of chemistry we had won our way from the era of scarcity to the era of plenty "which seems to be ruining us." Scientists would put more people out of work than any Government could ever find work for.

"If we regard unemployment as a positive benefit of leisure, instead of a positive disadvantage of enforced idleness, we begin to get a different complexion on the problem. I honestly believe we are moving into a period when the unemployment, which has appeared to be our curse in the past, may prove one of the greatest blessings to mankind.

"I am not afraid of the inventions of the future, for I have sufficient confidence that the intelligence which produced the inventions of the past will be powerful enough to produce the solution. Nevertheless, there is not a University in the world that has a professor whose business it is to study the future."

Sir William Pope, F.R.S. proposed the toast of "The Guests," and replies were made by Prof. P. Debye, Sir Frederick G. Hopkins, P.R.S. and Sir David Milne-Watson. Among the others present were Mrs. G. T. Morgan, Dr. and Mrs. E. F. Armstrong, Mr. H. Ballantyne, Prof. E. C. C. Baly, Sir Ernest Benn, Bt., Mr. W. A. S. Calder, Dr. and Mrs. F. H. Carr, Mr. and Mrs. S. E. Carr, Dr. G. C. Clayton, M.P., Mr. F. W. Clifford, Sir Henry Dale, Dr. and Mrs. C. H. Desch, Mr. T. Dewhurst, Prof. F. G. Donnan, Sir Henry Fowler, Major and Mrs. F. A. Freeth, Prof. C. S. Gibson, Prof. R. Whytlaw-Gray, Sir Richard Gregory, Bt. and Lady Gregory, Sir Philip Hartog, Prof. W. N. Haworth, Prof. C. K. Ingold, Principal Sir James C. Irvine, Lady Melchett, Dr. and Mrs. S. Miall, Mr. R. B. Pilcher, Mr. H. J. Pooley, Mr. and Mrs. J. Davidson Pratt, Prof. and Mrs. H. Raistrick, Mr. W. Rintoul, Sir Robert and Lady Robertson, Prof. and Mrs. R. Robinson, Lord Rutherford, Prof. and Mrs. J. L. Simonsen, Mr. and Mrs. Clarence Smith, Sir Frank E. and Lady Smith, Mr. J. Stenhouse, Prof. and Mrs. J. F. Thorpe, Lord Trent,

Sir Alexander Walker, Mr. J. A. Frome Wilkinson, Mr. C. B. Woodley, and Prof. W. P. Wynne.

Faraday Lecture

The fifteenth Faraday Lecture was delivered in the lecture theatre of the Royal Institution on March 29 by Prof. Dr. P. Debye, the president, Prof. G. G. Henderson, F.R.S., occupying the chair. The subject was "The relations between stereochemistry and physics." The lecture will be published in the JOURNAL of the Chemical Society.

At the conclusion of the lecture the president presented to Prof. Debye the Faraday Medal. He said that the lecturer was a worthy successor of Faraday, and his discourse had been delivered in the only appropriate place—Faraday's lecture theatre. A vote of thanks to the lecturer, proposed by Sir William Bragg and seconded by Prof. F. G. Donnan, was carried with acclamation.

A vote of thanks to the managers of the Royal Institution for the privilege of using the Lecture Theatre was proposed by the president and carried unanimously.

BRITISH ASSOCIATION OF CHEMISTS

Addressing a meeting of the Manchester Section of the Association at the annual dinner on March 15, with Mr. M. F. S. Choate presiding, and in the presence of Prof. E. C. C. Baly, president of the Association, Mr. C. B. Woodley, general secretary, said that in such an important industrial area as Manchester there were great opportunities to advance the interests of the B.A.C. It was very pleasing to report that 25% of the applications for membership received during the past five months had come from chemists in the Manchester Section.

It was impossible for any chemist to say in such times as these that he had anything like security of tenure; but it was because the Association had looked ahead in 1922 that it had been able to provide a means by which the chemist could ensure himself against unemployment. The record of the Unemployment Benefit Fund was magnificent. More than £8500 had been paid out in benefit. He hoped that the next development would be the organization of a pension scheme. He thought members did not fully realize the close touch which the Appointments Bureau kept with employers. During the past year 1400 appointments had been notified for full members, probationers, and students, covering all branches of industry.

The success of the Legal Aid Department was not sufficiently well known. There had been many successes in the courts and the precedence of three months' notice for the chemist in the absence of agreement to the contrary had been firmly established by the Association.

Prof. Baly expressed his pleasure at being the guest of the Manchester Section, and said it was necessary to interest more young chemists. Many eminent men had given of their best because they were interested in the future of the B.A.C., and because all had to serve. The activities of the Association were essential to the professional chemist, and there was no doubt that all chemists would ultimately be enrolled.

The toast of "Our Guests" having been duly honoured, Dr. T. Callan, chairman of the Manchester Section of the Society of Chemical Industry, replied on behalf of the guests. He had been impressed by Prof. Baly's speech and noted how the B.A.C. stressed its service to young members of the profession. He fully appreciated this viewpoint, but thought that if the B.A.C. appealed more strongly for support by the older members of the profession that they, in turn, would influence the younger generation. He would have been very grateful for the help of such an institution 25 years ago. He had delayed becoming a member of the B.A.C. because of the multiplicity of scientific societies; it was impossible to support all. Prof. Baly said he could appreciate Dr. Callan's reason for not having become a member. He could visualize, however, a united society of which the B.A.C. would form an integral part.

INTERNATIONAL SOCIETY OF LEATHER TRADES CHEMISTS

A meeting of the British Section of the I.S.L.T.C. was held on Saturday, March 11, at the Leather Industries Department, Leeds University, Dr. A. Turnbull, president, in the chair.

After formal business had been concluded, the chairman of the tannin analysis sub-committee recommended to the Section that the modified Riess method be adopted as the only official method of filtration from a date not later than January 1, 1934. This was carried *nem. con.*, and will thus go forward to the Amsterdam Conference in September.

Dr. D. Burton then gave an interim report from the sub-committee on leather analysis dealing with the determination of acidity. Five leathers had been examined by seven chemists by the Innes and Thompson–Atkin methods. Both methods showed in all cases that four of the leathers were entirely free from mineral acid, and both methods showed that one leather contained mineral acid. (At the special meeting of the sub-committee held later in the day, it was decided to study some "border line" leathers.)

Mr. G. F. Robertshaw reported considerable progress in the work of the sub-committee on oils and fats, in the direction of effecting pan-European standardization of methods.

Mr. Hill described two methods which were under consideration by his committee on the detection of phenylene diamines in leather. These both appeared satisfactory for *p*-phenylene diamine, but further work was required before they could be described as satisfactory for *m*-phenylene diamine.

Dr. Burton then reported on the work of the sub-committee on the determination of p_H of tannin extracts. Satisfactory results had been obtained with sulphited extracts by the use of the glass electrode. Some of the Continental workers in this field were evidently still attached to the quinhydrone electrode, and there would probably be some animated discussion at the forthcoming Amsterdam Conference.

Mr. A. B. Craven reported that a Products and Specifications Committee was now being formed by the British Standards Institution to deal with standardization in the leather industry. This committee would consist of representatives of all branches of the industry.

Dr. A. Colin Russ then read his paper on "Contribution to the Study of the Estimation of Fat and Water Solubles in Leather." The equilibrium constant for leather undergoing extraction is useful in determining distribution between fat dissolved by solvent, and fat still left in the leather; similarly for the water solubles. The present work shows that the constant varies with the volume of extracting liquid—with progressive increase of volume it also increases, then reaches a maximum, and finally decreases.

The experiments (over 100 extractions) at the same time confirm a theory put forward earlier to account for such variations. In doing so, three useful constants are employed of which one is derived from the other two, as a characteristic of the leather under the type of extracting system containing it.

The characteristic is the maximum constant K for the given system. It is independent of the shape or form of the leather sample (shavings, pieces or bends). It is the same as the biggest concentration of fat or water solubles retained by the leather per unit concentration of the external equilibrium extract. If one had two hides of very different quality, but of the same vegetable tannage, then irrespective of the solubles content the one with the higher maximum K is of the less firmly woven structure. The two constants which give this K measure the effect of physical structure and of the surface layers of fat or solubles on the fibrils. They determine the fractional amount of the total solubles or fat extracted by any given volume of water or solvent.

An interesting feature was the possibility of determining the true water solubles in leather without restriction of conditions in regard to volume of water used. In applying the formula $F = E_1^2/(E_1 - E_2)$ the extent of hydrolysis is not, after all, a serious factor. This fact should considerably help towards adopting a rational and standard analytical procedure. To this end, a new type of apparatus was exhibited for very refined work in conjunction with a microburette. (At the meeting Dr. Colin Russ suggested the application of similar principles for eliciting the true acidity of leather as distinct from leather extracts.)

Mr. R. F. Innes read a paper on "A Laboratory Method for Stripping Vegetable Tanned Leather." He showed that stripping leather by immersing it for 24 hr. in a 70% acetone solution enabled tannin to be recovered from it, enough for a qualitative examination of the tanning material, whereas an aqueous extract frequently removed very little tannin.

His second paper dealt with "The Cause and Prevention of Deterioration of Vegetable Tanned Leather on Storage." An entirely new light was thrown on many inconsistent and contradictory facts connected with the problem, which had baffled the leather and allied trades for generations, such as (1) the survival of leathers prepared 100 years ago or more; (2) some books have remained sound while others uniformly bound and stored had rotted badly; (3) the survival of leathers tanned with catechol tannins and dyed in the presence of sulphuric acid; (4) leathers dyed with wood dyes last better than those dyed with aniline dyes. Numerous examples were shown where crust leathers withstood this artificial rotting test and dyed leathers failed under it, also other examples of crust leather which had been so treated that they failed under the test, and many dyed leathers so treated that they resisted artificial rotting. The author also described the method he had adopted to demonstrate the parallelism of artificial rotting with natural rotting. It therefore appears likely that premature decay can be prevented, and that sooner or later confidence in leather as a covering material for books, chairs, etc. will be restored.

CORRESPONDENCE

PHOSPHORIC ANHYDRIDE AS DRYING AGENT

SIR,—My attention has been drawn to remarks made by Prof. Bone and by Prof. Baker in your issues of March 17 and March 24 respectively, about work in Oxford on the kinetics of gaseous reactions. I hardly imagine that these are meant to apply to my work, or specific criticism would have been forthcoming at the proper time and in the proper place, but lest there should be any misunderstanding I should like to be allowed to state one or two facts.

The criticism in general terms is that results are vitiated by the use of impure gases and by the employment of impure phosphorus pentoxide as a drying agent.

(1) As far as my own laboratory is concerned the method of generating gases has generally been to use an all-glass system previously highly evacuated, to generate the gas, pass it over suitable purifying agents, if condensable to distil it from liquid air, and then to store it in a holder over purified mercury (except of course with corrosive gases). Prof. Baker mentions oxygen specifically. We have usually made this gas by heating potassium permanganate. This gives a gas which may contain chlorine and which certainly contains carbon dioxide: but since we always passed the gas over glass wool soaked in a syrup of potash, and collected over mercury, neither impurity could have survived.

(2) With regard to phosphorus pentoxide we have always used a pure form which contains no trace of lower oxides, and gives no positive reaction to any of the three tests of Shenstone and Beck (J.C.S., **63**, 1893, p. 478).

(3) In any case, care in preparation of materials is by itself not enough. I go further than Prof. Bone and Prof. Baker and maintain that no method of purification, however elaborate, can be trusted unless the kinetic behaviour of the products is such as to show that adventitious impurities are playing no part. The situation is quite different from that in atomic weight determinations. For example 5% of nitrogen or carbon dioxide may have a negligible influence, while one part in a million of some catalyst may be very serious. For example, we have actually found that hydrogen from a cylinder behaves in the hydrogen-oxygen reaction just like hydrogen admitted directly to the reaction vessel by diffusion through a hot palladium tube. In several combustion reactions we have actually proved cylinder oxygen to give the same result as purified oxygen from potassium permanganate. On the other hand, traces of impurity, *e.g.*, iodides in the ether

decompositions, which would have escaped analytical detection, were at once recognized by the internal evidence of the reaction velocity measurements themselves to be playing an important part.

(4) As regards the validity of recent work on chain reactions Prof. Bone's objections are not specific enough to reply to. Certain well-marked phenomena, reproducible not only in Oxford but in other laboratories in England and abroad, have been observed. In the original papers these have been discussed and hypotheses about them examined. Criticism which attempts to attribute these observations to the effect of impurities *should be based upon a direct refutation of the experimental* evidence to the contrary, or at least should be *capable of suggesting in a detailed way how the effects* are produced.

I am, Sir, etc.,
C. N. HINSHELWOOD

Physical Chemistry Laboratory,
Balliol College and Trinity College,
Oxford
Apr. 3, 1933

SIR,—Under the above heading there have appeared two letters (cf. CHEM. AND IND., March 17 and 24) dealing in part with a question of chemical technique which I am neither competent nor willing to discuss. In the later contribution however, Prof. H. B. Baker bases some strictures on the effect of Part II of the Honours School of Chemistry at Oxford on statements of fact which show that he has been misinformed. There is first the question of the length of the Part II year; my friend *defines this as twenty-four weeks which is the* length of the "Full Term" year. Actually no Part II student who has the ambition to succeed can possibly confine his efforts to these limits, and in point of fact he normally works the full academical term and well into the vacation. I did not notice any change in this particular respect on proceeding from University College, London, to Oxford. Again, I wish to assert in the most categorical manner that it is not the case that the work of Part II students is expected to lead to publication or that the supervisor must rack his brains to find topics that can be completed in a year's research by prentice hands. In exceptional cases publication is possible, *but a far more usual sequence is an exploratory investigation* in collaboration with one Part II candidate followed by *careful revision with a second and often with a* third in succeeding years.

I am, Sir, etc.,
R. ROBINSON

Dyson Perrins Laboratory,
University, Oxford
Apr. 3, 1933

SIR,—My attention has recently been drawn to two letters which appeared in the issues of CHEMISTRY AND INDUSTRY of March 17 and March 24 respectively. Both concern in particular a paper published by Messrs. Forde, Cairns, and myself, entitled "The Oxidation of Carbonyl Sulphide," whilst more general matters relating to the progress of science in Oxford are discussed.

It is hardly within my province to discuss the latter question, but with regard to the former I should like to *explain that the comments of Prof. Bone and of Prof.* Baker are unjustified.

Prof. Baker first objects to the use of cylinder oxygen in the experiments described. In the paper quoted it was *explicitly stated that this procedure was justified* by the fact that pure oxygen prepared by heating *potassium permanganate* gave identical results. Prof. Baker suggests that oxygen prepared from potassium *permanganate* may contain chlorine; actually the oxygen was collected in an evacuated system over mercury, so that this would be impossible.

Prof. Bone criticizes the use of phosphorus pentoxide which had not been subjected to special purification. I have to-day made a careful examination of the phosphorus pentoxide employed and it appears that lower oxides such as Prof. Bone describes are not present in detectable amount. The tests applied were those given by Shenstone (J.C.S., 1893, **63**, 478) and are said to be very sensitive. Prof. Bone's surmise is therefore not sustained.

It is unfortunate that the last sentence of the paragraph requoted by Prof. Bone has led to a misunderstanding. When quoted out of its proper context it is even more misleading. The original intention was to imply that the quite remarkable concordance of results of many different experimenters in many laboratories in the study of reactions of the type under discussion, must surely be more than fortuitous, when each observer employed a drying agent of a different degree of purity. *Even Prof. Bone would, I feel, have to regard this fact* as of some significance.

With reference to Prof. Baker's remark that it is essential for a research candidate at Oxford to produce *a piece of finished work suitable for immediate publication* in the short space of one year, may I point out that the work on the oxidation of carbonyl sulphide was carried out by me in collaboration with one pupil during one year, not published, and then repeated, revised, and extended in collaboration with another pupil in the year following.

Prof. Baker's hypothesis about "a sly hit at their tutor" is entirely and utterly incorrect, and his regret at the "lamentable efforts" of the young pupils hardly relevant.

I am, Sir, etc.,
H. W. THOMPSON

St. John's College, Oxford
Apr. 3, 1933

PERSONAL AND OTHER ITEMS

We regret to learn of the death on March 27 of Mr. F. P. Bayley, of the Manchester chemical manufacturing firm of Bayley, Clanahan & Co. Mr. Boyley was for many years a member of the board of the Manchester Chamber of Commerce and served on the committee of the Chemical Section. He was a member also of the British Chemical & Dyestuffs Traders' Association. It is a remarkable though tragic coincidence that his death should have taken place on the same day as that of his former partner, Mr. Hugh C. Clanahan (reported in the last issue of CHEMISTRY AND INDUSTRY),

with whom he was associated until the beginning of this year, becoming sole partner of the firm on Mr. Clanahan's retirement.

Mr. Bernard Hobson, M.Sc., a member of the Council of Sheffield University, who died in December last, left estate of the gross value £147,187, with net personalty £142,125. His bequests included £1000 to the British Association for the Advancement of Science, for the promotion of geological research, and the residue of his property, after life interest, has been left to the University of Sheffield.

We regret to learn of the death on March 19 of Mr. A. W. C. Harrison, chief chemist of William Harland & Sons, Ltd., paint, cellulose, and varnish manufacturers. Mr. Harrison was known to many in the industry as a writer on the technology of paints and varnishes, and at one time lectured on the subject at the Regent Street Polytechnic, London. He had also served on the Council of the Oil and Colour Chemists' Association.

Mr. E. G. Cubitt has retired on account of ill-health from the chairmanship of Lawes Chemical Manure Co., Ltd., after having held the position for 32 years. He is succeeded by Mr. F. A. Perkins, whose family has had a long association with the company.

Mr. G. H. Bagnall, at present organizing secretary of the north-west area of the Amalgamated Society of Dyers, is to be the new general secretary of the society.

Chemical Engineering Group

The annual dinner of the Group will be held at the Waldorf Hotel on Friday, April 28. Lord Melchett as principal guest will deliver an address on "Modern Economics and Unemployment." Members who are interested may obtain tickets, 12s. 6d. each, on application to the offices of the Chemical Engineering Group, Abbey House, London, S.W.1. Ladies will not be present.

British Standard Specifications

A new specification, No. 481—1933, has just been issued dealing with Woven Wire and Perforated Plate Sieves and Screens for Industrial Purposes. The Society has been represented on the committee responsible for this specification and we are asked to recommend members to adopt the new standard wherever possible. Copies post free at 2s. 2d. may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1.

Chemical Works Explosion

An explosion which wrecked the Mitcham works of W. J. Bush & Co., Ltd., manufacturing chemists and distillers of essences, occurred on March 30 and was heard for some miles around in South London. Many cottages in the district were destroyed by the force of the explosion, one person being killed and more than twenty being injured.

The cause of the catastrophe has not yet been made known, although inspectors from the Home Office have completed an enquiry. Ten men were on the premises at the time of explosion early in the morning, and according to a statement made to the Press by the manager of the works it appears possible that the trouble was started by the ignition of some inflammable vapour, although how the ignition occurred is not known. A storage tank of methylated spirit was first blown up and this was followed a quarter of an hour later by another explosion which wrecked the whole roof of the building. Three of the employees were removed to hospital with serious injuries, and another employee was less seriously injured, the other casualties being caused by the collapse of buildings in the neighbourhood. A number of families were rendered homeless by the explosion, and a relief fund was opened and has now reached more than £1000.

Chemical Workers' Wages

The wages agreement between the Chemical Workers' Union and the Drug and Fine Chemical Manufacturers' Association expired on March 31, and it is reported that representatives of members of the Union have decided to prepare a new draft agreement providing for a minimum wage of 80s. for men and 40s. for women, a 40-hour week, and the preparation of a schedule of poisons to be handled only by adult workers. It is stated that the employers' association has given notice to the union of its intention not to negotiate a further agreement.

Donations for Research to the Cancer Hospital (Free) London

Recently the investigations on the chemical aspects of the cancer problem which are in progress at the Research Institute of The Cancer Hospital (Free), Fulham Road, London, have received recognition and financial assistance from two sources.

The Trustees of the Halley Stewart Trust have made a grant for a period of three years to support a whole-time worker who will undertake biochemical investigations into the metabolism of cancerous growths. Dr. C. A. Mawson of the Victoria University of Manchester has been appointed to carry out this work. A grant has been received also from the International Cancer Research Foundation, an organization established last year in Philadelphia by Mr. William H. Donner, and endowed by him with a sum of $2,000,000. The Trustees have awarded a sum of £1000 per annum for a period of two years to the Cancer Hospital Research Institute in support of investigations into factors which underlie the origin of malignant growths. This sum will provide two research studentships, to one of which Mr. C. A. D. Haslewood has been appointed.

Institute of Metals

The Institute of Metals has elected the following officers for the year 1933—34: *President:* Sir Henry Fowler, K.B.E.; *Vice-Presidents:* Dr. C. H. Desch, F.R.S., and Prof. R. S. Hutton; *Members of Council:* Sir Robert Dixon, K.C.B., Messrs. W. Lambert, C.B.E., H. C. Lancaster, A. H. Mundey, A. J. G. Smout, and F. Tomlinson.

The Silver Jubilee meeting of the Institute will be held on September 18—21 in Birmingham, where the first general meeting of the Institute was held in the autumn of 1908 under the presidency of the late Sir William H. White.

World Power Conference

Particulars are now available of the Sectional Meeting of the World Power Conference which is to be held in June—July this year. The reception is to be held in Copenhagen on Monday, June 26, with the

official opening of the Conference on the following Wednesday, June 28, at Stockholm. The Norwegian part of the programme begins on Friday, July 7, and the final proceedings are at Oslo on July 8. Full details of the programme and application forms for membership can be obtained from the British National Committee of the Conference, 63, Lincoln's Inn Fields, *London*, W.C.2.

Prague Samples Fair and Czechoslovak Trade with Britain

This year's Spring Fair at Prague was held from March 19 to 26. The number of exhibitors and the space occupied were nearly the same as last year, when the figures were 2184 exhibitors with stands occupying 32,100 sq. *metres. In 1929 (the most successful year)* the exhibits numbered 2930 and occupied over 44,000 sq. metres. As on previous occasions the exhibits were arranged in 17 industrial groups: electrical, mechanical, and optical instruments were grouped together, whilst chemicals (heavy, fine, pharmaceutical, etc.) were associated with chemical engineering and sanitation. Glass, porcelain, and ceramics formed a *separate group.*

Among the exhibits from abroad was a collective stand of Polish goods, whilst a similar but smaller display from Bulgaria attracted some attention. Despite the prevailing conditions and international difficulties *there is reason to suppose that the Fair was a success.* On the opening day 80,000 visitors attended, and the daily average was about 50,000. The foreign visitors were mostly from the neighbouring and Balkan countries, but quite a number of buyers came from Great Britain, *U.S.A., Canada, and South Africa.*

Czechoslovakia's trade with Britain, which had been well maintained in 1931, was very much curtailed in 1932 and amounted to less than one-third of that for the preceding year. Exports (especially glass, leather goods, and sugar) were most seriously affected, although imports suffered as well. Britain sent much less woollen and cotton goods, machinery, and manufactured goods to Czechoslovakia, but electrical apparatus (including wireless) and chemicals (including paints and varnishes as well as pharmaceutical products) were in better demand. Last year Britain exported to Czechoslovakia more animal products, gums, resins, and precious metals than during 1931, but the total increase in value of these items was far less than the decline in the main imports from England. The trade returns for January of this year indicate that, to every country, Czechoslovak imports declined, sometimes almost to the point of extinction. Czechoslovak imports from other countries also showed a marked decline except in the cases of Canada and Bulgaria, from whom Czechoslovakia took *considerably more products than usual and with whom* trade appears definitely to be on the increase.

Czechoslovakia is a small producer of precious metals. In 1932, 180 kg. of gold were extracted in Slovakia; 27,000 kg. of silver were obtained at Pribram, Bohemia, together with 36,000 cb. m. of lead. The Slovak mercury mines produced 20,000 kg. of that metal last year compared with 12,000 kg. in 1931. The State Radium Mines at Jáchymov (St. Joachimsthal) produced preparations containing 4000 mg. of radium last year compared with 3200 mg. of the element in 1931.

COMPANY NEWS

IMPERIAL CHEMICAL INDUSTRIES, LTD.

Following the preliminary statement of gross income and profit (cf. CHEM. AND IND., March 24), the report of Imperial Chemical Industries, Ltd., now states that dividends from associated and subsidiary companies amounted in 1932 to £6,012,293, as compared with £4,208,029 in 1931, whilst investments yielded £403,130, a decrease of £57,526 from the previous year's figure. The total cost of depreciation of wasting assets, minor services and contingencies, which was provided for against profits, was £2,256,901. The directors state *that there was a definite increase in turnover during the* year as compared with 1931, and the general improvement has been brought about by this increase, coupled with economies in organization and the fact that new capital spent for increasing efficiency is having effect.

BRITISH ALUMINIUM CO., LTD.

At the meeting of the company on March 31 the chairman, Mr. R. W. Cooper, said that although there had been a reduction in the tonnage of total sales following on the contraction in the use of aluminium throughout the world, the company had the advantage of an increased percentage of the sales. Developmen of the uses of aluminium and its alloys had procede satisfactorily, and certain new applications were bein vigorously followed up. Reference was made to the us of aluminium in speed record machines, whilst the meta was also advancing in its use for transport vehicles and a rapid advance was being made in certain case in the use of aluminium foil for heat insulation. A feature of growing importance was the evolution o light-weight Diesel engines, in the construction of whic aluminium was making it possible to bring the powe weight ratio into line with that of the petrol engin In the electrical industry the "Grid" was almo complete, and before the end of 1933 it was expecte that nearly 20,000 miles of steel-cored aluminiu conductor would be employed. In constructional wo aluminium was coming more into use on account of i decorative and weight-saving values, and as a means reducing the risk of fire.

STEWARTS AND LLOYDS, LTD.

The directors of the company, tube manufacturers Glasgow, have recommended that no dividend be pa on the deferred capital for 1932. Dividends out profits are recommended on the 6% first, 10% secor and 5% third preference shares for the half-year end December 31, 1932, at the respective rates, less tax.

INTERNATIONAL NICKEL CO. OF CANADA

During 1932 the company sustained a net loss $135,345, compared with a net profit of $5,094,497 1931. The accounts of the company show that improvement in business began in the second quar of the year and continued, the earnings in the fi quarter being $1,366,339, compared with $871,(and $470,931 in the third and second quarters respe ively. Sales of nickel during the year amounted 34,406,953 lb. representing a falling-off of 38%. Sa of monel metal declined 42% to 7,624,298 lb. and rol nickel 4% to 3,938,782 lb. Copper sales showed large decrease, being 96,919,677 lb. in 1931 and 57,662,' lb. in 1932.

MARKET REPORT

This Market Report is compiled from special information received from the manufacturers concerned.

Unless otherwise stated, the prices quoted below cover fair quantities net and naked at sellers' works.

GENERAL HEAVY CHEMICALS

Acid, Acetic, 40% tech.—£20 5s. per ton d/d address U.K. in casks.

Acid Chromic.—11d. per lb., less 2½% d/d U.K.

Acid Hydrochloric.—Spot, 3s. 9d.—6s. per carboy d/d according to purity, strength, and locality.

Acid. Nitric 80° Tw.—Spot, £18—£20 per ton makers' works, according to district and quality.

Acid, Sulphuric.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

Ammonia (Anhydrous).—Spot, 10d. per lb. d/d in cylinders.

Ammonium Bichromate.—8d. per lb., d/d U.K.

Bisulphite of Lime.—£6 10s. per ton f.o.r. London, packages free.

Bleaching Powder, 35/37%.—Spot, £8 15s. per ton d/d station in casks, special terms for contracts.

Borax Commercial.—Granulated, £15 10s. per ton; Powder, £17 per ton. (For 1-ton lots and upwards, packed in 1-cwt. bags, carriage paid any station in Great Britain.)

Calcium Chloride, Solid, 70/75%.—Spot, £5 5s.—£5 15s. per ton d/d station in drums.

Chrometan.—Crystals, 3¾d. per lb.; Liquor, £19 10s. per ton d/d U.K.

Chromium Oxide.—10d.—10½d. per lb., according to quantity, d/d U.K.

Methylated Spirits, 61 O.P.—Industrial, 1s. 8d.—2s. 3d. per gal.; Pyridinized Industrial, 1s. 10d.—2s. 5d. per gal.: Mineralized, 2s. 9d.—3s. 3d. per gal. 64 O.P. 1d. extra in all cases. Prices according to quantity.

Nickel Sulphate.—£52 per ton d/d.

Nickel Ammon. Sulphate.—£52 per ton d/d.

Potash, Caustic.—£30—£33 per ton. Potass. Bichromate crystals and granular.—5d. per lb., net d/d U.K., for spot. Discount according to quantity. Ground, 5⅜d. per lb. Potass. Chlorate.—3¾d. per lb. ex whf. Lond. in cwt. kegs.

Potassium Chromate.—6½d. per lb., d/d U.K.

Sal ammoniac, Firsts lump.—Spot, £42 17s. 6d. per ton d/d address in barrels. Chloride of Ammonia.—£37—£45 per ton, carr. paid.

Salt Cake, unground.—Spot, £3 15s. per ton d/d station in bulk.

Soda Ash, 58° E.—Spot, £6 per ton, f.o.r. in bags, special terms for contracts.

Soda, Caustic, solid 76/77° E.—Spot, £14 10s. per ton d/d station in drums, special terms for contracts.

Soda crystals.—Spot, £5—£5 5s. per ton d/d station or ex depôt in 2-cwt. bags.

Sod. Acetate 97/98%.—£21 per ton. Sod. Bicarbonate (refined).—Spot, £10 10s. per ton d/d station in bags. Sod. Bichromate Crystals, Cake, and Powder.—4d. per lb., net d/d U.K., discount according to quantity. Anhydrous 5d. per lb. Sod. Bisulphite Powder 60/62%.—£16 10s. per ton delivered, 1-cwt. iron drums for home trade.

Sodium Chromate.—3⅞d. per lb., d/d U.K.

Sod. Phosphate.—£12 10s. per ton, f.o.r. London, casks free. Sod. Silicate 140° Tw.—Spot, £8 5s. per ton d/d station, *returnable drums*. Sod. Sulphate (Glauber's Salt).—Spot, £4 2s. 6d. per ton d/d. Sod. Sulphide solid, 60/62%.—Spot, £10 15s. per ton, d/d in drums. Crystals, 30/32%.—Spot, £8 per ton, d/d in casks. Sod. Sulphite, Pea Cryst.—Spot, £13 10s. per ton, d/d station in kegs; Commercial.—Spot, £9 10s. per ton, d/d station in bags.

RUBBER CHEMICALS

Antimony Sulphide.—Golden.—6½d.—1s. 1½d. per lb., according to quality. Crimson.—1s. 3d.—1s. 5d. per lb., according to quality.

Arsenic Sulphide, Yellow.—1s. 6d.—1s. 8d. per lb.

Barytes.—£7 10s.—£9 per ton, according to quality.

Cadmium Sulphide.—3s. 1d.—3s. 5d. per lb.

Carbon Bisulphide.—£30—£32 per ton, according to quantity, drums extra.

Carbon Black.—3⅞d.—5¼d. per lb., ex wharf.

Carbon Tethachloride.—£41—£46 per ton, according to quantity, drums extra.

Chromium Oxide, Green.—1s. 2d. per lb.

Diphenylguanidine.—2s. 2d. per lb.

India-rubber Substitutes, White.—4¼d.—4¾d. per lb. Dark.—3½d.—4½d. per lb.

Lamp Black.—£46—£50 per ton.

Lead Hyposulphite.—9d. per lb.

Lithopone, 30%.—£18—£19 per ton.

Mineral Rubber "Rupron."—£18 10s. per ton.

Piperidine Rubber Accelerators.—P.P.D.—10s. 6d.—11s. 6d. per lb.; Z.P.D.—7s.—7s. 6d. per lb.; L.P.D.—6s. 6d.—7s. per lb.; P.T.D.—9s. 8d.—10s. 4d. per lb.; C.P.D.—8s. 3d.—8s. 10d. per lb.; S.P.D.—8s. 1d.—8s. 7d. per lb.; P.T.M.—11s. 6d.—12s. 6d. per lb.

Sulphur.—£12 per ton. Sulphur Precip. B.P.—£55—£60 per ton. Sulphur Precip. Comm.—£50—£55 per ton.

Sulphur Chloride.—5d.—7d. per lb., according to quantity.

Vermilion, pale or deep.—4s. 5d.—4s. 9d. per lb.

Zinc Sulphide.—1s. 1d.—1s. 2d. per lb., according to quality.

WOOD DISTILLATION PRODUCTS

Acetate of Lime.—Brown, £8 10s.—£8 15s. per ton. Grey, £13—£14 per ton. Liquor, Brown, 30° Tw., 6d. per gal.

Acetic Acid, technical, 40%.—£17—£18 per ton

Amyl Acetate, technical.—95s.—110s. per cwt.

Charcoal.—£6—£11 per ton, according to grade and locality.

Methyl Acetone, 40/50%.—£50—£52 per ton.

Wood Naphtha.—Miscible.—2s. 7d.—4s. per gal. Solvent, 3s. 9d.—4s. 9d. per gal.

Wood Tar.—£2—£6 per ton.

Wood Creosote.—6d.—2s. per gal.

Acid Carbolic.—Crystals.—9d.—11d. per lb. Crude 60's, 1s. 11d.—2s., 2% water, 2s. 5d. per gal.

TAR PRODUCTS

Acid Carbolic.—Crystals—9d.—11d. per lb. Crude 60's, 1s. 11d.—2s. per gal. 2% water—3s. 0¾d. per gal.

Acid Cresylic, 99/100.—11d.—1s. 8d. per gal. according to specification. Refined, 1s. 7d.—1s. 8d. per gal. Pale, 98%, 1s. 2d.—1s. 3d. per gal. 95%, 11d.—11½d. per gal. Dark, 10d. per gal.

Anthracene Oil, Strained, 4½d. per gal.

Benzole.—Prices at works: Crude, 10¼d.—11d. per gal.; Standard motor, 1s. 6½d.—1s. 7d. per gal.; 90%, 1s. 7d.—1s. 8d. per gal.; Pure, 1s. 10d.—1s. 11d. per gal.

Xylol.—1s. 11d.—2s. per gal. Pure, 2s.—2s. 2d.

Creosote.—B.S.I. specification, 2½d.—3d. per gal., d/d. Heavy—4d. per gal.

Naphtha.—Solvent 90/160, 1s. 5d.—1s. 6d. per gal. Solvent 95/160, 1s. 7d.—1s. 8d. per gal. Solvent 90/190, 9d.—1s. 2d. per gal.

Naphthalene.—Purified crystals, £9 10s. per ton in bags. Crude, Hot Pressed, £6 5s. per ton. Flaked, £11 per ton.

Pitch, medium, soft.—90s. per ton, in bulk at makers' works.

Pyridine.—90/140—3s. 9d. per gal.; 90/160—4s.—4s. 6d. per gal.; 90/180—2s.—2s. 3d. per gal.

Toluole.—90%, 2s.—2s. 1d. per gal. Pure, 2s. 4d. per gal.

PHARMACEUTICAL AND PHOTOGRAPHIC MATERIALS

Acid, Acetic, Pure 80%.—£39 5s. per ton d/d address U.K. *in casks.*

Acid, Acetyl Salicylic.—2s. 9d.—2s. 11d. per lb., accord*ing to quantity.*

Acid, Benzoic, B.P.—1s. 9d.—1s. 11d. per lb. Solely ex *Gum.*—1s. 3d.—1s. 6d. *per oz.; 50-oz. lots,* 1s. 3d. per oz.

Acid, *Boric,* B.P. Cryst., £35 10s. *per ton.* Powder, £36 10s. per ton. Ex-Fine Powder, £38 10s. per ton. For 1-ton lots and upwards, packed in 1-cwt. bags, carriage paid any station in Great Britain.

Acid, Camphoric.—19s.—21s. per lb.

Acid, Citric.—9½d. per lb. Less 5%.

Acid, Gallic.—2s. 9d. per lb. for pure crystal in 1-cwt. lots.

Acid, Molybdic.—5s. 3d.—5s. 9d. per lb., according to quantity.

Acid, Pyrogallic, Cryst.—6s. 9d. per lb. for 1-cwt. lots. Resublimed.—8s. 6d. per lb. for 28-lb. lots d/d.

Acid, Salicylic.—B.P. pulv., 1s. 7d.—1s. 10d. per lb. Technical, 1s. 2d.—1s. 4d. per lb.

Acid, Tannic, B.P.—3s. 9d. per lb.

Acid, Tartaric.—10¾d. per lb. Less 5%.

Acetanilide.—1s. 5d. per lb.

Ammon. Benzoate.—3s. 6d. per lb.

Ammonium Hippurate.—19s. 6d.—23s. 6d. per lb.

Ammonium Iodide.—17s.—17s. 6d. per lb.

Ammonium Molybdate.—5s.—5s. 6d. per lb., according to quantity.

Argent. Nitras, Crystal.—1s. 1d. per oz.

Arsenic Iodide.—22s. 6d.—25s. per lb.

Benzonaphthol.—3s. 3d.—3s. 9d. per lb.

Berberine, Hydrochloride.—5s. 6d.—6s. per oz.; Sulphate, 5s. 6d.—6s. per oz.

Bismuth Salts.—Carbonate, 6s. 10d. per lb.; Citrate, 9s. 3d. per lb.; Nitrate (cryst.), 4s. 7d. per lb.; Oxide, 10s. 6d. per lb.; Salicylate, 7s. 7d. per lb.; Subchloride, 10s. 3d. per lb.; Subgallate, 7s. 3d. per lb.; Subnitrate, 5s. 11d. per lb. Above for cwt. lots. Extra and reduced prices for smaller and larger quantities respectively. Liquor Bismuthi, P.B., in W. Qts.—1s. 1½d. per lb.; 6 W. Qts.—11d. per lb.; 12 W. Qts.—9½d. per lb.; 36 W. Qts.—9d. per lb.

Borax, B.P.—Crystal, £24 10s. per ton. Powder, £25 per ton. For 1-ton lots and upwards, packed in 1-cwt. bags, carr. paid any station in Great Britain.

Bromides, B.P.—Ammonium.—1s. 10d. per lb. Pota ium.—1s. 7d. per lb. Sodium.—1s. 9d. per Prices for 1-cwt. lots.

Cadmium Iodide.—17s. 6d.—18s. per lb.

Calcium Hippurate.—26s.—30s. per lb.

Calcium Iodide.—20s. per lb.

Calcium Lactate, B.P.—1s. 2d.—1s. 4d. per lb., acco ing to quantity.

Camphor.—Refined flowers, 3s. 1d.—3s. 2d. per Transparent tablets, 3s. 4d.—3s. 6d. per lb., acco *ing to quantity; also special contract prices.*

Chloroform.—2s. 3d.—2s. 8d. per lb.

Cocaine, Alkaloid and Citrate.—For export.—29s. 1 —31s. 7d. per oz. Hydrochloride and Nitra 27s. 1d.—28s. 11d. per oz.

Ergosterol.—2s. 6d. per gm.

Ethers.—S.G. 730, 1s. 1d.—1s. 2d. per lb., according quantity, and other prices according to spec *gravity.*

Hexamine.—2s. 6d.—2s. 10d. per lb., according *quantity.*

Hippuric Acid.—17s. 6d.—21s. 6d. per lb.

Hydrogen Peroxide (12 *vols.*).—1s. 4d. per gal., f.o makers' works, naked. B.P.—10 vols., 2s.—2s. *per gal.; 20 vols., 3s. per gal.*

Hypophosphites.—Calcium, 2s. 9d.—3s. 2d. per *Potassium.*—3s.—3s. 5d. *per lb.* Sodium, 2s. 1 —3s. 4d. per lb.

Iodine Resub., B.P.—14s. 8d.—18s. 9d. *per lb.*

Iodoform, B.P., Cryst., Precip. or Powder.—17s. 7d. 21s. 7d. *per lb.*

Iron Ammon. Citrate.—B.P.—1s. 10d. per lb. for 28- lots. Green, 2s. 6d. per lb. (list price).

Iron Iodide.—17s. 6d.—18s. per lb.

Iron Perchloride.—18s.—20s. *per cwt., according* quantity.

Iron Quinine Citrate, B.P.—9¼d.—9¾d. *per oz., accor* ing to quantity.

Lead Iodide.—14s.—15s. per lb.

Lithium Carbonate, B.P., 1914.—5s. 4d. per lb.

Lithium Chloride, Cryst.—8s. 3d. per lb.

Lithium Citrate.—5s. 3d. per lb. Powder.—5s. 6 per lb.

Lithium Hippurate.—18s. 6d.—22s. 6d. per lb.

Lithium Iodide.—20s. 6d.—21s. 6d. per lb.

Magnesium Carbonate.—Light, 28s. per cwt.

Magnesium Oxide.—Light, 70s. per cwt.; Heav 1s. 8d. per lb.; in quantity lower.

Menthol.—A.B.R., recryst., B.P., 15s. 6d. per lb. ne Synthetic, 8s. 6d.—12s. per lb. Synthetic detache crystals, 8s. 6d.—10s. per lb., according to qua tity; Liquid (95%), 8s. 6d. per lb.

Mercurials, B.P.—Red oxide crystals, 5s. 10d.—5s. 11 per lb.; Levig, 5s. 4d.—5s. 5d. per lb.; Corrosi sublimate, Lump, 4s.—4s. 1d. per lb.; Powde 3s. 8d.—3s. 9d. per lb.; White precip., Lum 4s. 9d.—4s. 10d. per lb.; Powder, 4s. 11d.—5s. p lb.; Calomel, 4s. 9d.—4s. 10d. per lb. Yello Oxide, 5s. 2d.—5s. 3d. per lb.; Persulph., B.P.C 4s. 11d.—5s. per lb.; Sulph. nig., 4s. 10d.—4s. 11 per lb. Special prices for larger quantities.

Mercury, Benzoate.—8s. 3d. per lb.; Cyanide, 12s. 7d.— 13s. 1d. per lb.; Oleate (5%), 1s. 11d.—2s. 2d. p lb.; (10%), 2s. 9d.—3s. per lb.; (20%), 3s. 9d.— 4s. per lb. Protonitras, 6s. 9d. per lb.; Prot sulphate, 7s. 3d. *per lb.*; Subsulphate flav., 7s. 1 per lb.

Methyl Salicylate.—1s. 4½d.—1s. 6½d. per lb.

Paraformaldehyde.—1s. 3d.—1s. 5d. per lb.
Paraldehyde.—1s. 1d. per lb.
Phenacetin.—4s.—4s. 6d. per lb.
Phenolphthalein.—4s. 5d.—5s. 8d. per lb.
Potass. Bitartrate.—99/100% (Cream of Tartar), 82s. per cwt., less 2½%.
Potass. Citrate.—B.P., 1s. 8d. per lb. for 28-lb. lots.
Potass. Ferricyanide.—1s. 7½d. per lb., in 125-lb. kegs.
Potass. Iodide, B.P.—13s.—15s. 6d. per lb., according to quantity.
Potass. Permanganate.—8¼d. per lb. for 1-ton lots.
Potass. Metabisulphite.—50s. per cwt. d/d London, kegs free.
Potassium Hippurate.—26s.—30s. per lb.
Quinine Sulphate.—1s. 10d. per oz., for 100-oz. tins, tins free.
Saccharin.—37s. 6d. per lb., and lower in quantity.
Salicin.—15s.—16s. per lb., according to quantity.
Santonin.—£50 per kilo for 5-kilo lots.
Seidlitz powder (pulv.).—66s. 3d.—70s. per cwt.
Silver Nitrate.—1s. 3¼d. per oz. for quantity. Sticks, 2d. per oz. extra.
Sod. Barbitonum—12s. 9d.—14s. per lb.
Sod. Benzoate, B.P.—1s. 7d. per lb., according to quantity.
Sod. Citrate, B.P.C., 1911.—1s. 5d. per lb. B.P.C., 1932, and U.S.P.—1s. 9d. per lb. for 28-lb. lots.
Sodium Hippurate.—23s. 6d.—27s. 6d. per lb.
Sod. Hyposulphite.—Photographic, £15 per ton d/d consignee's station, in 1-cwt. kegs.
Sodium Iodide, B.P.—14s.—17s. 1d. per lb.
Sod. Nitroprusside.—16s. per lb.
Sod. Potass. Tartrate (Rochelle Salt).—75s. per cwt. net for 1-ton lots. Crystals, 2s. 6d. per cwt. extra.
Sod. Salicylate.—Powder, 2s.—2s. 8d. per lb. Crystal, 2s. 1d.—2s. 9d. per lb.
Sod. Sulphide.—Pure recryst., 10d.—1s. 2d. per lb.
Sod. Sulphite anhydrous.—£23—£25 per ton, according to quantity, d/d U.K.
Strontium Iodide.—17s. 6d. per lb.
Tartar Emetic B.P. cryst. or powder.—1s. 9d.—2s. per lb.
Terpine hydrate.—1s. 2d.—1s. 5d. per lb.
Thymol, Puriss.—5s. 9d.—6s. 6d. per lb., according to quantity. Natural.—12s. per lb.
Zinc Iodide.—21s.—22s. per lb.
Zinc Stearate.—1s. 4d.—1s. 6d. per lb.

PERFUMERY CHEMICALS

Acetophenone.—7s. per lb.
Aubepine (*ex Anethole*).—8s. per lb.
Amyl Acetate.—2s. 3d. per lb. Amyl Butyrate.—4s. per lb. Amyl Cinnamic Aldehyde.—8s. 3d. per lb. Amyl Salicylate.—2s. 9d. per lb. Anethol, 21/22° C., 4s. 9d. per lb.
Benzaldehyde free from Chlorine.—2s. 9d. per lb.
Benzyl Acetate from Chlorine-free Benzyl Alcohol.—2s. per lb. Benzyl Alcohol free from Chlorine.—2s. per lb. Benzyl Benzoate, 2s. 3d. per lb.
Cinnamic Aldehyde.—Natural, 12s. 3d. per lb.
Citronellol.—8s. 6d. per lb.
Citral.—6s. 6d. per lb.
Coumarin.—15s. per lb.
Ethyl Cinnamate.—8s. 6d. per lb.
Ethyl Phthalate.—2s. 6d. per lb.
Eugenol.—7s. 6d. per lb. Geraniol (Palmarosa).—17s. per lb. Geraniol.—6s. 6d.—11s. per lb. Heliotropine.—6s. per lb. Iso Eugenol.—9s. per lb. Linalol.—(*ex Bois de Rose*) 6s. 9d. per lb.—(*ex Shui Oil*) 6s. per lb. Linalyl Acetate.—(*ex Bois de Rose*) 8s. 3d. per lb.—(*ex Shui Oil*) 7s. per lb.
Methyl Anthranilate.—9s. per lb.
Methyl Benzoate.—4s. 6d. per lb.
Musk Ketone.—33s. per lb.
Musk Xylol.—8s. per lb.
Nerolin.—5s. per lb.
Phenyl Ethyl Acetate.—10s. per lb.
Phenyl Ethyl Alcohol.—8s. 6d. per lb.
Rhodinol.—60s. per lb. Safrol.—1s. 7d. per lb. Terpeneol.—2s. per lb. Vanillin (*ex Clove Oil*).—16s.—18s. per lb.—(*ex Guaiacol*)—14s. 3d.—16s. 3d. per lb.

ESSENTIAL OILS

Almond.—Foreign S.P.A., 9s. 6d. per lb. Anise.—2s. per lb. Araucaria, 9s. per lb. Bergamot.—6s. 9d. per lb. Bourbon Geranium, 26s. per lb.
Camphor.—Brown, 85s. per cwt. White, 90s. per cwt. Cananga, Java, 10s. 9d. per lb. Cinnamon Oil.—4s. per lb. Cassia, 80/85%, 4s. 9d. per lb.
Citronella Oil.—Java, 2s. 10d. per lb. Ceylon, 2s. 4d. per lb. Clove.—90/92% English, 5s. per lb.
Eucalyptus, Australian B.P., 70/75%.—1s. per lb. Lavender.—Mont Blanc, 38/40%.—10s. 6d. per lb. Lemon.—4s. 3d. per lb. Lemongrass.—2s. 10d. per lb. Orange, Sweet.—6s. per lb. Otto of Rose.—Anatolian, 37s. 6d. per oz.; Bulgarian, 55s. per oz. Palma Rosa, 9s. 6d. per lb.
Peppermint.—Japanese, 6s. 9d. per lb. Wayne County, 14s. per lb. Petitgrain.—6s. per lb.
Sandalwood, Mysore.—30s. per lb. 90/92%, 20s. per lb. Australian, B.P. and French Codex, 92/95%, 16s. per lb.

INTERMEDIATES

Items marked thus * d/d buyers' works.

*Acid, Benzoic, 1914 B.P. *ex Toluol*.—1s. 9½d. per lb. in casks.
*Acid Gamma.—Spot, 4s. per lb., 100%.
*Acid H.—Spot, 2s. 4½d. per lb., 100%.
*Acid Neville and Winther.—Spot, 3s. per lb., 100%.
*Acid Sulphanilic, 8d. per lb.
*Aniline Oil, spot, 8d. per lb., drums extra.
*Aniline Salts, spot, 8d. per lb., casks free.
*Benzaldehyde, spot, 1s. 8d. per lb., packages extra.
*Benzidine Base.—Spot, 2s. 5d. per lb., 100%.
o-Cresol 30/31° C.—£2 6s. 5d. per cwt. in 1-ton lots.
m-Cresol 98/100%.—2s. 3d. per lb., in ton lots.
p-Cresol 34.5° C.—1s. 9d. per lb., in ton lots.
Dichloraniline.—2s. per lb.
*Dimethylaniline.—Spot, 1s. 6d. per lb., packages extra.
Dinitrobenzene.—8½d. per lb.
Dinitrotoluene 48/50° C.—8½d. per lb. 66/68° C.—9d. per lb.
*Diphenylamine.—Spot, 2s. per lb.
*α-Naphthol.—Spot, 2s. 4d. per lb.
*β-Naphthol.—Spot, £78 15s. per ton, in paper bags; £79 15s. per ton in casks, in 1-ton lots.
*α-Naphthylamine.—Spot, 11½d. per lb.
*β-Naphthylamine.—Spot, 2s. 9d. per lb.
o-Nitraniline.—5s. 10d. per lb.
**m*-Nitraniline.—2s. 7d. per lb.
**p*-Nitraniline.—Spot, 1s. 8d. per lb.
*Nitrobenzene.—Spot, 4¼d. per lb., 5-cwt. lots, drums extra.
Nitronaphthalene.—9d. per lb.
*Sodium Naphthionate.—Spot, 1s. 9d. per lb., 100%.
**p*-Toluidine.—Spot, 1s. 11d. per lb.
**o*-Toluidine.—Spot, 9½d. per lb., drums extra.
m-Xylidine acetate, 3s. 6d. per lb., 100%.

GENERAL NOTES

Official Trade Intelligence

The Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1, has received the following inquiries for British goods. British firms may obtain further information by applying to the Department and stating the specific number. *Brazil:* Gumlac (481). *Cuba:* Tinplate, linseed oil (483). *Egypt:* Photographic materials (B.X. 7527); Paper (B.X. 7534). *New Zealand:* Disinfectant (F.X. 1730). *Syria:* Colour and varnish, tinplate, lacquered tinplate (477).

Import Duties Advisory Committee

The Import Duties Advisory Committee gives notice of applications for an increase of import duty on: (*a*) Cast-iron porcelain enamelled baths. (*b*) Chocolate and sugar confectionery, and for drawback under Section 9 of the Finance Act, 1932, in the case of top dyeing machines in respect of the castings and sheets of Krupp's V1A welding quality stainless steel used in their manufacture. Representations regarding these applications should be addressed to the secretary, Import Duties Advisory Committee, Caxton House, Tothill Street, London, S.W.1, not later than April 10.

Lecithin in Confectionery Manufacture

Many manufacturers of confectionery now realize some of the advantages to be obtained by the use of lecithin, particularly the beneficial effect on viscosity which the lipoid has when used in very small amounts in chocolate manufacture. It is possible however that the full usefulness of the material and its wide range of applications have yet to be fully appreciated. A little booklet which sets out these advantages has just been issued by Boake, Roberts & Co., Ltd., of Carpenters Road, Stratford, London, with the title "Lecithin." Of particular interest is the information given as to the economy of fat made possible by the use of lecithin. In the case of moulded chocolates for instance, the use of 0·5% of "Choc-Collabrac" (containing cocoa-butter and 60% lecithin) with 32% fat gives a consistency equivalent to that with 38% fat alone, a saving of 6% fat. The booklet sets out many of its advantages in connexion with "sweating," fat-dispersion, retarding of rancidity, and similar problems of the confectioners, and provides a number of useful formulæ. The booklet can be obtained (free) from Boake Roberts & Co., Ltd., by all manufacturing confectioners interested.

British Standards Institution

The half-yearly handbook which has recently been issued by the British Standards Institution provides an up-to-date list of the B.S. Specifications with both numerical and subject indexes. It should be in the hands of all drawing offices and contracts departments of public authorities and firms throughout the engineering, building, chemical and allied industries, who will find the Standards of much assistance in the preparation of contracts and tenders. The activities of the three divisions, engineering, building and chemical, as indicated in the list of new specifications in preparation, provide interesting reading and show the valuable work voluntarily carried out by the Institution's six hundred technical committees. Copies are available from the British Standards Institution (Publications Department), 28, Victoria Street, London, S.W.1, price 1s. 2d post free.

Industrial Equipment

Mining & Industrial Equipment Ltd., report having received orders for the following equipment: *England*—one 7-ft. by 60-in. Hardinge ball mill, with reverse current air classification for grinding coal; one No. 50 Raymond Impax pulverizer for calcining and grinding gypsum; two No. 70 Raymond Impax pulverizers for grinding bituminous coal; one No. 0000 Raymond pulverizer for grinding soap powder; two 4-ft. by 8-ft. type 400, Hum-mer electric screens for screening billy coal; two 4-ft. by 8-ft., type 400, Hum-mer electric screens for screening coal; one 3-in. X grit pump for pumping flue dust slurry. *Wales*—four 10-ft. by 72-in Hardinge conical ball mills for grinding Welsh anthracite; one No. 0000 Raymond pulverizer for chemical grinding. *India*—one 8-ft. by 48-in. Hardinge conical ball mill for grinding crude copper ore. *S. America*—one 2-in. X grit pump to deliver 100 U.S. gal. per minute containing solids. *Russia*—three 4-roller Raymond mills for grinding clay.

Bakelite Mouldings

Bakelite mouldings have been used for industrial purposes for twenty-three years. The electrical industry used them from the first, and the radio industry has relied upon such mouldings from its inception. To-day however bakelite is employed in numerous industries, and the many widely varying uses are well illustrated in No. 3 of Volume I of "Bakelite Progress" published by Bakelite, Ltd., 68, Victoria Street, S.W.1. Bakelite laminated material has opened up new possibilities for the decorative expert, whilst many will learn with interest of the use of "Trefoil" Bakelite Silent Gear Material for the idler gear in the camshaft drive of the Talbot car.

PUBLICATIONS RECEIVED

DER CHEMIE-INGENIEUR: EIN HANDBUCH DER PHYSIKALISCHEN ARBEITSMETHODEN IN CHEMISCHEN UND VERWANDTEN INDUSTRIEBETRIEBEN. Edited by A. Eucken and M. Jakob. With a Preface by F. Haber. Vol I PHYSIKALISCHE ARBEITSPROZESSE DES BETRIEBES. 2nd Part. MECHANISCHE MATERIALTRENNUNG. Edited by A. Eucken. Revised by C. Naske, H. Madel, and W Siegel. Pp. x + 385. Leipzig: Akademische Verlagsges., 1933. Paper, 36 m.; bound, 38 m.

BRITISH INDUSTRIES AND THEIR ORGANIZATION. By G. C Allen, Ph.D. Pp. xi + 338. London: Longmans Green & Co., 1933. 10s. 6d.

CATALYSIS AND ITS INDUSTRIAL APPLICATIONS. By E. B Maxted, D.Sc., Ph.D., F.I.C. Pp. xii + 529 London: J. & A. Churchill, 1933. 36s.

MANUAL FOR FOOD PREPARATION STUDY. By F. B. King Ph.D. Pp. x + 111. London: Chapman & Hall Ltd. New York: J. Wiley & Sons, 1933. 9s. 6d.

SOIL FERTILITY PROBLEMS IN NATAL. By C. O. Williams B.Sc. Union of South Africa. Department of Agriculture. Chemistry Series No. 124. Science Bulletin No. 110. Pp. 39. Pretoria: Government Printer 1932. 3d.